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EXPERIMENT STATION RECORD

VOL. 73 JULY 1935 No. 1

EDITORIAL

THE AGRICULTURAL DEPARTMENT APPROPRIATION ACT OF 1936

The latest of the annual acts making provision for the Federal Department of Agriculture was signed by President Roosevelt on May 17, 1935. It covers the fiscal year ending June 30, 1936, and appropriates $125,113,483.14. The corresponding act for 1935 carried $60,223,007, but an assumption that the financial resources of the Department will be more than doubled would be far from correct. For both years supplementary funds greatly exceed the "routine" appropriations. In 1935 there were $112,500,000 in emergency allotments, mainly for road construction, $10,465,486 for the so-called "permanent" appropriations made available without specific reappropriation, and about $2,000,000 for deficiencies due mainly to salary restorations. All these raised the Department's total to nearly $186,000,000, exclusive of the Agricultural Adjustment Administration, which is financed separately. For 1936 the appropriations carried in the act are supplemented by permanent appropriations reduced by legislation shifting a number of items to an annual basis to $8,452,596, while the full amount of allotments from emergency funds had not been announced at the time of writing.

Eliminating road funds and restricting further discussion to what are termed the "ordinary" activities of the Department and analogous payments to the States, the provision for 1935 was $62,104,500 and for 1936 will be $68,409,223. Of this increase of $6,304,723, $1,815,589 is required to maintain Department salaries on the 100 percent basis which was restored as of April 1, 1935. Most of the remainder, or approximately $4,500,000, is available for the development of existing lines of work and the initiation of new projects.

The research activities of the Department for 1935 are estimated to have received $13,158,019, and the payments to the States under the Hatch, Adams, and Purnell Acts were $4,388,000. For 1936 these figures are increased to $16,032,327 and $4,395,000, respectively. In general terms, the new provisions permit of expenditures for research considerably greater than have been possible since the fiscal year 1932.

Among the new items of interest is one of $75,000 for the administration and maintenance of the Research Center at Beltsville, Md., where investigations are already being carried on by six Bureaus of the Department. About 5,200 acres of land are now included in the center, and new buildings and other permanent equipment are being completed from P. W. A. funds at an estimated cost of about $3,000,000. There is also an allotment of $32,000 for the operation of a semicommercial creamery at Beltsville, transferring thereto work carried on by the Bureau of Dairy Industry since 1915 in cooperation with a creamery in Grove City, Pa.

The allotments in the act to the Bureau of Animal Industry indicate a net increase for that Bureau from $8,802,787 to $11,313,419. This is largely because of the inclusion of $3,000,000 from a permanent appropriation under the Meat Inspection Act to an annual basis. A decrease of $1,500,000 is made in the allotment for indemnities to owners of cattle destroyed in the tuberculosis eradication campaign, but $3,000,000 has been allotted for this purpose from funds available under the Jones-Connally Act. An increase of $15,000 has been made for investigations of swamp fever, and $117,000 for animal husbandry investigations, the latter being subdivided to provide $25,000 for the development of a breed of hogs similar or superior to the Danish Landrace, the quality of pork from which has won a virtual monopoly of the British market; $25,000 for record-of-performance testing of Red Danish cattle; $27,000 for poultry record-of-performance testing; and $40,000 for cooperation of State authorities in the administration of regulations for the improvement of poultry, poultry products, and hatcheries.

The Bureau of Plant Industry receives $4,998,497, an increase from $3,672,475. The principal new item is that of $483,198 for the operation of a number of plant reserve stations for revegetation, soil protection, and related purposes established with P. W. A. funds. Other additions include $50,000 for cereal breeding, $233,343 for cotton breeding and other studies, $40,000 for investigations of the control and eradication of bindweed and other noxious weeds, $10,050 for cultural tests of pyrethrum and devil's-shoestrings and $10,000 for the introduction of other potential plant sources of insecticides, $100,000 for studies of problems associated with grass in the control of soil erosion and land utilization as affected by crop adjustments involving the substitution of grazing crops for corn, grains, or cotton, and $68,499 for tobacco investigations. The allotment for fruit and vegetable crops and diseases shows a net increase of $147,756, and that for the development of the National Arboretum one of $5,000, while there is a decrease of $50,000 in

the project for Asiatic explorations in search of plants for erosion control.

The allotment of the Forest Service is increased from $8,619,323 to $11,600,973. Much of this is for the administration of the national forests, $836,123 being a replacement of P. W. A. funds, $763,492 for the management of new forest areas being acquired, and $235,746 for additional plantings, while $250,000 is to continue the forest survey initiated with emergency funds. An increase of $111,684 for forests, $836,123 being a replacement of P. W. A. funds, $763,492 known as the Rocky Mountain Forest Experiment Station and $50,000 for the operation of the Institute of Forest Genetics. It is expected that this institute, established near Placerville, Calif., in 1925 with private funds as the Eddy Tree Breeding Station and valued at over $250,000, will be donated to the Government for maintenance as a center in forest genetics work.

The Bureau of Chemistry and Soils receives $1,279,434, and $281,-362 is provided elsewhere in the act for soil erosion investigations. The comparable appropriations of the Bureau for 1935 were $1,035,-145. The largest increase is that of $93,817 for the soil survey, which has now been completed for over half the agricultural area of the United States and is being more and more utilized in connection with the emergency and readjustment programs. Other increases include $36,560 for fruit and vegetable utilization and other chemical studies, $15,150 for selenium land poisoning investigations, and $15,000 for studies of naval stores.

The total for the Bureau of Entomology and Plant Quarantine is increased from $3,218,456 to $7,801,421. Allotments of $400,000 for the gypsy and brown-tail moth campaign, $250,000 for blister rust control, and $200,000 for barberry eradication are in lieu of grants for 1935 from the Public Works Administration, while funds made immediately available of $2,500,000 for chinch bug control and $480,000 for screw worm control appear as new items. Allotments which carry substantial increases include $399,531 for fruit insects, $350,000 for Japanese beetle control, $140,460 for Mexican fruit fly control, $160,015 for forest insects, $261,156 for Dutch elm disease eradication, $361,418 for tobacco and other truck crop and garden insects, and $347,229 for cereal and forage insects (including not to exceed $15,000 for the Mormon cricket). Enlargement of insecticide studies is also provided for, including increases of over $100,000 for a number of studies of the spray residue problem.

For the Bureau of Agricultural Economics there is provided $5,724,801, an increase from $4,963,701. Funds for the enforcement of the various acts administered by the Bureau are considerably increased, including $250,922 additional for the Cotton Futures and

Standards Acts. For marketing and distribution studies $743,654 are allotted, an increase of $134,560 which includes $55,000 to expand spinning tests of cotton. Oher increases include $30,410 for farm management and farm practice studies, $57,588 for crop and livestock estimates, $71,410 for foreign competition and demand studies, $41,398 for market inspection of farm products, $73,624 for the market news service, and $17,343 for cotton grade and staple statistics.

The allotment under the Office of Experiment Stations is $4,620,-546, an increase from $4,590,102. This includes payments of $4,395,-000 to the States, Alaska, Hawaii, and Puerto Rico under the Hatch, Adams, and Purnell Acts and supplementary legislation, $156,235 as the administrative funds of the Office itself, and $69,311 for the maintenance of experiment stations in Hawaii and Puerto Rico.

Payments to the States, Hawaii, and Alaska under the Smith-Lever and Capper-Ketcham Acts and supplementary legislation are continued at $4,072,000, and the allotment for farmers' cooperative demonstrations is increased from $684,648 to $747,248. The Extension Service appropriations as a whole are $4,974,754, an increase of $87,816.

Largely because of advancing printing costs and to provide for an enlarged congressional allotment of Farmers' Bulletins, the Department's quota for printing is increased from $610,466 to $800,000, and the total allotment for the Office of Information from $934,107 to $1,163,282. The Weather Bureau receives an increase from $3,032,-292 to $3,439,204, mainly for general weather service and aerology, but with $15,000 for special frost warnings in the citrus fruit-growing areas of Florida. For the Bureau of Biological Survey there is provided $1,421,492, an increase from $1,204,084. Snow surveys and forecasts of irrigation water supplies are to be instituted by the Bureau of Agricultural Engineering, and its total is increased from $350,318 to $423,269. The Food and Drug Administration receives $1,968,637, an increase from $1,557,713, mainly for the enforcement of the Food and Drugs Act; the Bureau of Home Economics, $193,485, an increase of $14,784; and the Library $99,812.

Because of the uncertainty as to supplemental allotments, the new appropriation act lacks much in finality as an indicator of prospective activities. Definite provision is made, however, for the continuance of practically all of the Department's projects, in many cases on an enlarged basis, and for the initiation of not a few new undertakings. The increased support for research is especially noteworthy and encouraging.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the Oregon Station] (*Oregon Sta. Bul. 334 (1934), pp. 34, 49, 50, 71*).—These have included a study of the effect of sulfur sprays on the spoilage of canned fruits; the brining of cherries; the discoloration of canned green asparagus; a rapid test method for the moisture content of nuts; and a rapid method for the determination of moisture in filberts, devised by D. E. Bullis and E. H. Wiegand.

The influence of pH on the optical rotation of proteins, H. J. ALMQUIST and D. M. GREENBERG (*Jour. Biol. Chem., 105 (1934), No. 3, pp. 519–522, fig. 1*).—Noting that the salt of an optically active acid or base usually has an optical rotation value quite different from that of the undissociated substance, that the rotation changes in acid or alkaline solution according to the titration curve of the mother substance, and that this principle can be applied to the study of the nature of the combination of proteins with acids and bases, as reported in an earlier paper (E. S. R., 67, p. 4), with respect to the change of the optical rotation of purified egg albumin with pH, the authors of this contribution from the University of California here present further data concerning the change of the optical rotation of egg albumin, serum albumin, livetin, and casein in acid and alkaline solutions.

The effect of variation of pH upon the process of heat denaturation of egg albumin, B. M. HENDRIX and P. S. WHARTON (*Jour. Biol. Chem., 105 (1934), No. 4, pp. 633–642, fig. 1*).—An egg albumin solution heated at pH 7.0 had acid- and base-combining properties very similar to those of a solution heated under like conditions at pH 3.0. Egg albumin heated or treated with alcohol at its isoelectric point (pH 4.8) showed a behavior different from that of the product of heating at other pH values.

"The striking similarity between the curves for heat-coagulated unfiltered albumin, heat-coagulated dried albumin, and alcohol-coagulated albumin indicates the same process to be effective in each case. Certainly the change in combining capacity of the protein for acid and alkali is of the same order. The loss of combining power might be pictured as due either to a decrease in the number of free acid and basic groups of the protein molecule or to a decrease in their degree of dissociation. The fact that the curves for coagulated and uncoagulated protein tend to approach each other at very low and very high pH levels might be taken as evidence for the latter view. Such behavior could as well be explained, however, on the basis of hydrolytic processes occurring in the more acid and alkaline regions."

The effect of dry heat and dilute alkali on the lysine content of casein, R. J. BLOCK, D. B. JONES, and C. E. F. GERSDORFF (*Jour. Biol. Chem., 105 (1934), No. 4, pp. 667, 668*).—Untreated casein, casein treated with dilute alkali, and casein heated dry for 65 min. at 150° C. were examined by means both of the Van Slyke method (E. S. R., 26, p. 22) and a modification of the Kossel and

Kutscher method (E. S. R., 58, p. 12) to determine the effect of the treatments upon the lysine content.

It was found that "the proportion of lysine yielded by acid hydrolysis of casein is not materially affected by treatment with dilute sodium hydroxide or by dry heat at 150°. When casein is dissolved in weak alkali the lysine 'rest' is not altered, but some nitrogenous substance is produced which is determined as lysine, according to the Van Slyke nitrogen distribution method. Furthermore, when casein is heated at 150°, it is not unlikely that a molecular rearrangement is brought about so that a part of the lysine precursors (rests) become resistant to enzymatic degradation. This resistance to enzymatic hydrolysis would explain in part the lowered nutritive value of the heated protein."

The basic amino acids of three crystalline mammalian hemoglobins.—Further evidence for a basic amino acid "anlage" of tissue proteins, R. J. Block (*Jour. Biol. Chem., 105 (1934), No. 4, pp. 663–666*).—Horse, sheep, and dog hemoglobins yielded iron, arginine, histidine, and lysine in the molecular proportions of approximately 1 : 3 : 8 : 9, while the molecular proportions of iron, sulfur, and cystine were found to be 25 : 50 : 7, 25 : 100 : 14, and 25 : 75 : 21, respectively. "Thus the molecular ratio of the basic amino acids obtained from three crystalline mammalian hemoglobins is approximately constant. The yield of cystine, on the other hand, varies over 300 percent among these proteins, while, as is well known, the iron content is quite constant."

Spectrophotometric characteristics of hemoglobins, I, II (*Jour. Biol. Chem., 105 (1934), No. 4, pp. 741–752, pl. 1, figs. 2; 753–760, fig. 1*).—These two papers constitute a contribution from the Kansas State College and form part of an extended investigation of meat qualities.

I. *Beef blood and muscle hemoglobins*, J. H. Shenk, J. L. Hall, and H. H. King.—Solutions of muscle hemoglobin free from blood hemoglobin were prepared and examined by the spectrophotometer. These solutions gave absorption curves very similar to the curves obtained from blood hemoglobin, but the curves were displaced toward the red portion of the spectrum.

The ratio of the densities of the maximum absorption in the yellow to the maximum in the green, the ratios of both maxima to the minimum between them, and the ratio of the densities at from 577 to 582 mμ were found to be constant. The points of maximum absorption for blood oxyhemoglobin were found to be at 542 and 577 mμ, the minimum at 562 mμ as compared to 543, 582, and 564 mμ, the corresponding points for muscle oxyhemoglobin. A spectrographic study showed a very marked difference in the ultraviolet absorption spectra of the two hemoglobins and a similar difference in the absorption spectra of the globin fractions. Very little difference was shown between the acid hematin fractions.

A method for determining the relative percentages of blood and muscle hemoglobin in the same solution based on the ratio of the optical densities at 577 and 582 mμ is presented.

II. *Hemoglobin of fowls*, D. E. Klein, J. L. Hall, and H. H. King.—The hemoglobin contents of 100 chicken blood samples were determined by the Van Slyke method. The same samples were analyzed with the Bausch and Lomb spectrophotometer. The maximum and minimum points of absorption were determined, and the absorption factor at the principal maximum found. The absorption factors were plotted against the number of determinations and a maximum obtained at 1.2 mg of hemoglobin per cubic centimeter. Sixteen turkey blood samples were analyzed in the same manner as were those of chicken blood, and a similar inconstancy of absorption factors obtained.

Nine beef blood samples were also analyzed in the same manner, and a constant absorption ratio obtained at 1.165 mg of hemoglobin per cubic centimeter.

It is concluded that the inconstancy of absorption factors obtained was due to the heterogeneous character of the fowl blood itself and possibly also to retention of oxygen in the Van Slyke reaction chamber.

"Spectrophotometry gave excellent checks on duplicate samples, whereas the oxygen capacity method did not check as consistently on the same sample of blood."

On monolayers of proteolytic enzymes and proteins, J. H. SCHULMAN and E. K. RIDEAL (*Biochem. Jour., 27 (1935), No. 5, pp. 1581–1597, figs. 11*).—The two parts of this paper deal with (1) the reaction kinetics and (2) some of the structural characteristics of the enzymes. A part of the theoretical and experimental results are stated as follows:

"When solutions of pancreatin are injected under monolayers of proteins, such as egg albumin or caseinogen, proteolytic hydrolysis of the latter proceeds. The reaction can be followed qualitatively visually and quantitatively by observing the concomitant changes in phase boundary potentials." The reaction kinetics of the proteolytic digestion of protein monolayers follow closely those observed for the bulk phase reaction both in respect to dependence on the pH of the solution and the order of the reaction. "It is shown that the proteinase fraction of pancreatin is responsible for the removal of some 10 percent of the protein in the case of egg albumin and of 15 percent in the case of caseinogen, while the carboxpolypeptidase fraction removes a further 25 and 16 percent, respectively.

"The proteinase and carboxypolypeptidase fractions of pancreatin when purified by the precipitation or by the adsorption process forms films which are proteinlike in character. These are themselves capable of being hydrolyzed by pancreatin without loss of surface activity. The characteristics of films of trypsin are found to be indistinguishable from those of albumin over the region of pH in which they exhibit no tryptic activity, while over the active region they form solutions of low surface phase boundary potentials. It is shown that, when pancreatin solutions are digested by pepsin at pH 2 and the solution restored to pH 8, while no tryptic activity is observed for bulk phase reaction monolayers of egg albumin and caseinogen are readily digested. Solutions of trypsin when boiled at pH 8 likewise exhibit a marked surface proteolytic activity."

The properties of the surfaces of solutions containing both enzyme and protein were examined during the course of the reaction. It is concluded that in the tryptic enzymes the "free enzymes" can be separated from their proteinlike carriers, but when free can only react with proteins when presented to them in a suitable form, such as a monolayer at an air-water interface. "To render the free enzyme active for protein solutions it must be adsorbed on a protein in a particular state or configuration." Experimental evidence that the disappearance of a protein film on an enzyme containing substrate is due to digestion only and is not due to the adsorption of some constituent of the enzyme of lower surface tension is given.

Dilatometric studies in the hydrolysis of the 2,5-diketopiperazines and polypeptides.—I, Alkali hydrolysis of glycine and alanine anhydrides, M. SRINIVASAN and M. SREENIVASAYA (*Jour. Biol. Chem., 105 (1934), No. 3, pp. 563–570, figs. 2*).—The alkali hydrolysis of glycine and alanine anhydrides was investigated in the dilatometer and was found to be accompanied by an increase in volume.

In correlating the increases in volume with millimol releases of amino groups, as determined by the Van Slyke method, some abnormalities in the initial stages of the reaction were observed. "These abnormalities are greater the stronger the alkali, and appear to be associated with structural changes induced in the anhydride molecule preceding the hydrolysis. The hydrolysis of glycine anhydride by alkali of concentrations higher than 0.01 N is accompanied by a disruption of the resulting dipeptide as registered by the dilatometer, while the alanylalanine under the conditions of the experiment is not hydrolyzed.

"Seven and five-tenths mm³ per millimol is the dilatation constant obtained with glycine and alanine anhydrides. It is suggested that this value characterizes in general the fission of the diketopiperazine nucleus."

The quantitative extraction of histamine from tissues by electrodialysis, R. G. MacGregor and W. V. Thorpe (*Biochem. Jour., 27 (1933), No. 5, pp. 1394–1399, fig. 1*).—The alcohol extraction method with which the authors compare the electrodialytic procedure consisted in extracting the tissue first for 24 hr. with 96 percent alcohol, then with 60 percent alcohol for a further 24 hr., the combined extracts being concentrated under diminished pressure and extracted with ether to remove fats.

"By electrodialysis in a three-compartment cell a water-clear colorless extract is obtained in less than 2 hr. after receipt of the tissue. . . . In a large number of experiments . . . we have never found an electrodialyzate giving a smaller histamine value than an equivalent dose of an extract prepared by the alcohol method. (The histamine value of the extracts was obtained by matching against a standard of pure histamine on the blood pressure of an anesthetized cat.) Further, histamine added to blood, which contains no histamine, has been repeatedly extracted without loss. Histamine added to tissues which contain histamine has also been recovered without detectable loss.

"The process of electrodialysis does not subject the tissues in the middle compartment to any drastic conditions. The temperature does not rise above 40° [C.], and there is no great change in the pH of the liquid in the middle compartment. The method, therefore, supports the alcohol method not only quantitatively but also in the suggestion that the histamine in the tissues is, if not free, very loosely combined."

Various forms of the three-compartment cell were used, the anodes being carbon plates, the cathodes plates of pure nickel sheet, and the membranes of parchment dialyzing-paper, cellophane sheets, or collodion. The use of the last-named material was necessary in some cases to prevent substances giving the biuret reaction from passing through the membrane. A mechanical stirrer was used in the middle compartment.

Oxidation of glucose by air in the presence of iron pyrophosphate, A. Goerner (*Jour. Biol. Chem., 105 (1934), No. 4, pp. 705–709*).—Aeration of glucose solutions containing iron pyrophosphate, buffered at about pH 7.3, and protected from bacterial action by the addition of 1 part in 1,000 of mercuric chloride, yielded much carbon dioxide, the same mixtures without the iron giving practically no carbon dioxide. Increasing quantities of pyrophosphate added without changing the iron content not only showed no inhibitive action but appear to have increased the quantity of carbon dioxide produced.

Some physico-chemical properties of lactose.—IV, The influence of salts and acids upon the mutarotation velocity of lactose, B. L. Herrington (*Jour. Dairy Sci., 17 (1934), No. 10, pp. 659–670*).—Continuing this study (E. S. R., 72, p. 584), it was found that the mutarotation of lactose was acceler-

ated by molecules and by ions other than those of hydrogen and hydroxyl. This phenomenon was attributed to general acid and base catalysis. The catalytic influence of the anions of weak acids was much greater than that of the cations of weak bases. At concentrations below 0.1 N the catalytic effect of the lactate ion was relatively small but increased rapidly as the concentration became greater. While the catalytic effects of other salts in dairy products had not been determined, it did not appear that their influence would be important, except possibly in such concentrated products as milk powder and ice cream. An empirical equation is presented for estimating the velocity of mutarotation of lactose solutions at 25° C. and at various pH values.

The production of mucus during the decomposition of plant materials.—I, The effect of environmental conditions. II, The effect of changes in the flora, J. G. SHRIKHANDE (*Biochem. Jour., 27 (1933), No. 5, pp. 1551–1562, figs. 3; 1563–1574*).—In the first of the two papers here noted, the author describes an apparatus for measuring stickiness as the vertical pull necessary to separate two horizontal metal plates containing between them a known weight of the sample, and reports also upon experiments giving the following indications:

"In the presence of a mixed natural flora, the chief factors involved in causing stickiness in decomposing straw are the source of nitrogen supplied, the initial and final reactions of the material, and the degree of decomposition. High values for stickiness are given with either sodium nitrate or mold tissues as the sources of nitrogen. This suggests that an alkaline reaction and an abundance of microbial tissue are essential in the production of stickiness during decomposition by mixed flora. The final reaction of the manure profoundly influences the degree of stickiness, if at all appreciable. A pH of 9.5 to 10, whether obtained by fermentation or by subsequent adjustment, seems to give the maximum stickiness. Sodium or potassium ions produce more stickiness than calcium or magnesium."

In the work recorded in the second paper, a number of common soil fungi and two cellulose-decomposing bacteria in pure culture and in different associations were tested with reference to the production of stickiness and general decomposition.

"These fungi and bacteria, while working independently of each other, do not produce stickiness irrespective of the nature of the bacteria. Fungus decomposition followed by the action of *Mycobacterium agreste* does not produce stickiness. Fungus decomposition followed by the action of *Spirochaeta cytophaga* produces stickiness. Progressive decomposition with a fungus and subsequent inoculation with *S. cytophaga* at different stages produce stickiness even if the period of action of the fungus was brief. Simultaneous inoculations of fungus and *S. cytophaga* produce very little stickiness."

The amount of decomposition effected, the losses in carbohydrate constituents, and the nitrogen immobilization in each case were determined. All the substances studied were removed approximately in proportion to the apparent losses of dry matter.

Petroleum ether- and ether-soluble constituents of cranberry pomace, K. S. MARKLEY and C. E. SANDO (*Jour. Biol. Chem., 105 (1934), No. 4, pp. 643–653*).—A joint contribution from the Bureaus of Chemistry and Soils and Plant Industry, U. S. D. A., reports an investigation of the substances extracted by petroleum spirit and by ethyl ether from air-dried cranberry pomace, consisting of cuticle with some adhering cell tissue and seeds, the latter comprising about 25 percent of the weight of the residue.

The results indicated that "the waxlike coating of the cranberry is quite as unique chemically as the whole epidermis is anatomically", the petroleum-spirit extract from cranberry pomace being about twice that similarly obtained from grape pomace and the ether extract about three times as large. The petroleum-spirit extract was found to consist of the hydrocarbons, nonacosane, $C_{29}H_{60}$, and hentriacontane, $C_{31}H_{64}$; free solid fatty acids of the series C_{16} to C_{30}: the liquid acids, linolenic, linoleic, and oleic, the last predominating; a small amount of glycerol, believed probably to have been originally combined with acid in the form of a fat; and small amounts of unidentified solid and liquid substances. The ether extract obtained after extraction with petroleum spirit was found to consist of free ursolic acid together with an unidentified resin acid.

New U. S. Pharmacopoeial standards for cod liver oil, E. F. Cook (*Analyst, 59 (1934), No. 701, pp. 545, 546*).—Previously noted from another source (E. S. R., 71, p. 583).

The determination of inorganic phosphate in the presence of arsenic, L. B. Pett (*Biochem. Jour., 27 (1933), No. 5, pp. 1672–1676*).—In colorimetric phosphate determinations arsenate interfered by developing a blue color with the ordinary reagents, such as those of the Fiske and Subbarow method (E. S. R., 55, p. 310). In order to study the effects of arsenate on phosphatase activity this interference had to be prevented without hydrolyzing the residual phosphoric esters. No method previously described was found to be sufficiently accurate in the presence of the higher concentrations of arsenate. A satisfactory procedure involved reduction of the arsenate to arsenite, a form of arsenic which did not interfere with the phosphate determination.

Some limitations of the Carius digestion for the measurement of chloride in biological material, F. W. Sunderman and P. Williams (*Biochem. Jour., 27 (1933), No. 5, pp. 1578–1580*).—The experiments here reported upon showed that in some biological materials chloride is not completely measured by the direct open Carius method. Preliminary leaching with water in some instances gave almost complete recovery of the chloride, but "preliminary digestion with alkali is completely effective and is, therefore, the procedure of choice in dealing with such materials. We have been unable to demonstrate that this failure to measure chloride by the direct open Carius method is due to a loss of chloride in amounts greater than 1.8 millimols per liter of blood."

The micro-determination of bromine in blood, A. G. Francis and C. O. Harvey (*Biochem. Jour., 27 (1933), No. 5, pp. 1545–1550, fig. 1*).—Organic matter was destroyed by ashing samples of from 1 to 2 cc with 3 cc each of N potassium hydroxide solution and 0.1 cc of a 20 percent sucrose solution under controlled conditions described in detail. Under conditions also closely specified "a chromic-phosphoric acid mixture was used for liberating the bromine, and it was found that the conditions could be so adjusted that satisfactory figures were obtained by one aeration in the presence of an amount of sodium chloride approximating to that present in 2 cc of blood. . . . The recovery of bromine is within ±10 percent of the theoretical, which is satisfactory for work of this kind." For the detailed technic of the method and for the apparatus used in aerating the reaction mixture and collecting the bromine (in dilute starch-potassium iodide solution, for a subsequent titration with 0.002 N sodium thiosulfate solution), the original should be consulted.

The micro-determination of pentoses, free and combined, I, S. Andrews and J. A. Milroy (*Biochem. Jour., 27 (1933), No. 5, pp. 1421–1424*).—The principle of the micromethod employed is that of the production of furfuraldehyde by the action of acetic acid on pentoses, free and combined, in evacuated and

sealed tubes kept at 170° C. for some hours, together with a subsequent direct determination of the furfuraldehyde colorimetrically with anilene acetate. Numerous experiments were carried out in order to determine the conditions which led to maximum yields of furfuraldehyde.

AGRICULTURAL METEOROLOGY

Our expanding and contracting "desert", I. Bowman (*Geogr. Rev.*, *25 (1935), No. 1, pp. 43–61, figs. 15; abs. in Bul. Amer. Met. Soc., 16 (1935), No. 3, pp. 82, 83*).—The author cites evidence from various sources, such as glacier retreats, lake levels, tree rings, and sunspot numbers, that "the drought period of recent years has been only another downswing in a long, long story of climatic ups and downs. He states that "cycles there undoubtedly are in our climate, but as yet no man knows their beat, so that any but the most general predictions are unreliable. . . . The climatic facts alone are not going to decide which parts of the West will be permanently inhabited. Those submarginal areas that have lowest reliability of rainfall and that have the poorest soil and the roughest surface and lie farthest from transportation lines should be abandoned first of all."

The relation of drouth to water-use in Nebraska, G. E. Condra (*Nebr. Univ., Conserv. and Survey Div., Conserv. Dept. Bul. 6 (1934), pp. 24, figs. 11*).—From a survey of water resources in Nebraska, the average volume of each of the leading sources of supply is estimated as follows: "Rainfall, about 96,882,666 acre-ft.; surface water, about 1,200,000 acre-ft.; soil moisture, about 13,000,000 acre-ft.; and groundwater, more than 900,000,000 acre-ft., not including that in deep-seated storage." It is stated that the deficiency of rainfall of the State from 1931 to 1933, inclusive, and up to September 1, 1934, "was about 74,414,183 acre-ft. It was greatest in 1934, being about 47 percent below normal for the period from January 1 to September 1."

The various effects of drought on water supply are discussed. There is only incidental reference to use of water.

A study of South African rainfall: Secular variations and agricultural aspects, T. E. W. Schumann and W. R. Thompson (*Univ. Pretoria, ser. 1, No. 28 (1934), pp. 46, figs. 15*).—Reviewing and interpreting rainfall data collected at many stations in different parts of the Union of South Africa, it is stated that "over the last 40 to 50 yr. the annual rainfall in certain parts of South Africa shows a more or less definite though irregular downward trend. There is no proof, however, of any permanent diminution, and periods of plentiful rains may confidently be expected in the future."

While the decrease of rainfall in some areas has probably been the dominant harmful influence on vegetation, mismanagement and ill-treatment of the natural vegetation by overstocking, veld-burning, and other detrimental practices have also played a part. It is pointed out that "apart from direct effects on the vegetation, the low level of the Union's rainfall, during the last decade in particular, has affected every branch of agriculture vitally."

The relation between duration of sunshine and solar radiation sums [trans. title], F. Lauscher (*Met. Ztschr. [Braunschweig], 51 (1934), No. 12, pp. 437–449, figs. 3*).—The application of normal curves of solar radiation as related to duration and intensity of sunshine as affected by position and other modifying conditions is explained.

Quality of wheat as affected by meteorological conditions [trans. title], L. Alabouvette and H. Geslin (*Compt. Rend. Acad. Agr. France, 20 (1934)*,

No. 33, pp. 1082–1095, figs. 2).—Low humidity and high temperature during the ripening period, 35 to 40 days after heading, were found to be favorable to quick maturing and high bread quality as measured by Chopin's test (E. S. R., 52, p. 12).

Climatic factors as related to the quality of wheat [trans. title], H. GESLIN (*Ann. Agron.* [*Paris*], *n. ser., 5* (*1935*), *No. 2, pp. 205–218, figs. 4*).—This is a broader and more detailed account of studies noted above.

Meteorological factors that determine forest-fire hazard in Pacific countries, E. H. BOWIE (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vol. 3, pp. 1659–1664, fig. 1*).—This article emphasizes especially the important relations of water to forest fires. It maintains that "when evaporation predominates, forest fuels lose moisture and fire hazard increases; when condensation predominates, forest fuels gain moisture and fire hazard decreases. All other factors affecting fire hazard are less direct and are largely subsidiary to the fundamental factor of moisture."

Frost damage of sugarcane field in Formosa, M. SUZUKI (*Jour. Soc. Trop. Agr.* (*Nettai Nôgaku Kwaishi*), *6* (*1934*), *No. 2, pp. 131–143, fig. 1; Eng. abs., p. 143*).—Two formulas, derived from wet and dry bulb temperature, humidity, and observations on cloudiness, for forecasting minimum night temperatures to prevent frost damage to sugarcane, which it is stated hold better than Ångström's equation, are presented. The geographical distribution of frost damage to sugarcane in 1932 is discussed.

Monthly Weather Review, [September–October 1934] (*U. S. Mo. Weather Rev., 62* (*1934*). *Nos. 9, pp. 315–360, pls. 8, figs. 15; 10, pp. 361–396, pls. 8, figs. 19*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 9.—On the Relation between Rainfall and Stream Flow, by R. T. Zoch (pp. 315–322); The Snow Survey as an Index to Summer Precipitation, by O. W. Monson (pp. 322–330); Turbidity and Water Vapor Determinations from Solar Radiation Measurements at Blue Hill and Relations to Air-Mass Types, by H. H. Kimball (pp. 330–333); Estimating the Yield of Grain from the Weather, by A. H. Bogue (pp. 334–337); Time Limits of the Day as Affecting Records of Minimum Temperature, by E. S. Nichols (pp. 337–343); and The Tropical Disturbance of August 26–31, 1934, by W. R. Stevens (p. 344).

No. 10.—Quarterly Forecasts of Sea and Air Temperatures, by G. F. McEwen (pp. 361–364); An International Comparison of Standard Barometers, by S. P. Fergusson (pp. 364–366); Meteorological Conditions Preceding Thunderstorms on the National Forests.—I, Western and Central Oregon, by W. R. Stevens (pp. 366–370); Lightning Storms and Fires on the National Forests of Oregon and Washington, by W. G. Morris (pp. 370–375); The Effect of Time of Observation on Mean Temperature, by W. F. Rumbaugh (pp. 375, 376); The Use of Free-Air Soundings in General Forecasting, by H. R. Byers (pp. 376–378); A Remarkable Temperature Agreement at a 33-Year Interval, by J. B. Kincer and W. A. Mattice (pp. 378, 379); and Waterspouts, October 29, 1934, Buffalo, N. Y., Harbor, by J. H. Spencer (p. 380).

SOILS—FERTILIZERS

[Soils and fertilizer studies in Alabama] (*Alabama Sta. Rpt. 1933, pp. 15–19, 30, 31, fig. 1*).—The report includes notes on the determination of the lime

requirement of soils by casorption studies, by J. A. Naftel and R. E. Yoder; the use of quinhydrone with the glass electrode in determining the redox capacity of soils, by Naftel; relation of root system to minimum PO_4 concentration necessary for good growth, by A. L. Sommer; and causes of crop failures on new ground, by L. M. Ware and J. K. Boseck.

[Soils and fertilizer studies in Hawaii] (*Hawaii Sta. Rpt. 1934, pp. 2–4, 7, figs. 2*).—Continued work (E. S. R., 72, p. 298) is reported on the development of methods of determining the fertilizer needs of diversified crops on various soil types, based on the Mitscherlich principle, and on the ratio of the moisture equivalents of soils to their permanent wilting percentages.

[Soil investigations of the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 26–33*).—Brief notes are given on soil fertility investigations, by F. L. Duley and W. H. Metzger; the mineral content of plants as influenced by soil reaction and the mineral content of the soil, by H. H. King and A. T. Perkins; the influence of the absolute reaction of the soil solution upon the growth and activity of *Azotobacter*, by P. L. Gainey; the influence of legumes and free-living nitrogen-fixing organisms on the growth of plants and on the nitrogen balance, by H. E. Myers; a study of the soil solution as governed by H-ion concentration, by Perkins; and a study of replaceable cations and anions in some Kansas soils, by King and Perkins.

[Soil investigations of the Oregon Station] (*Oregon Sta. Bul. 334 (1934), pp. 36, 37, 78*).—Results reported include an investigation of the microbial decomposition of organic matter in certain Oregon soils and forest litter, the chemical composition of peat and muck soils in northwestern United States, and the role of sulfur in plant nutrition, the two last-named by W. L. Powers.

[Studies on soil problems by the Washington Station] (*Washington Sta. Bul. 305 (1934), pp. 21–24, 54*).—These have included investigations of hardpan formation in the irrigated soils of Washington and possible means of prevention and control, by L. C. Wheeting and S. C. Vandecaveye; studies of the maintenance of organic matter in eastern Washington soils, by Vandecaveye and Wheeting; of plant composition as influenced by variation in climate and soil type, by Vandecaveye, Wheeting, and G. O. Baker; of the fertility of irrigated soils, and of the changes occurring in irrigated soils as a result of irrigation, cropping, and fertilizer treatments, both by Vandecaveye and Wheeting; and of the maintenance of organic matter in central Washington, by Wheeting, Vandecaveye, and C. I. Seely.

The work of the Adams Substation has included studies of permanent fertility and organic matter maintenance, by H. M. Wanser.

[Soil Survey Reports, 1929 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1929, Nos. 31, pp. 36, figs. 4, map 1; 32, pp. 41, pl. 1, figs. 2, map 1; 33, pp. 48, pls. 2, figs. 4, map 1; 34, pp. 36, pl. 1, figs. 2, map 1; 35, pp. 50, pls. 2, figs. 2, map 1*).—The surveys here noted were made with the cooperation, respectively, of the Minnesota Experiment Station, the Michigan Station and Department of Conservation, the Texas Station, the Pennsylvania College and Station, and the Oregon Station.

No. 31. *Soil survey of Houston County, Minnesota*, A. L. Gray et al.—Houston County has an area of 361,600 acres, of which the surface features are for the most part those of an old plain now cut by streams "into an intricate pattern of deep valleys and ravines"; but the southwestern part of the county is comparatively smooth.

Fayette silt loam is the most important of the 19 types here grouped into 14 series which were found in Houston County, the type named occupying

31.1 percent of the soil area. It is followed in order of areal extent by 26.7 percent of rough stony land and by Dubuque silt loam 16.9 percent.

No. 32. *Soil survey of Alger County, Michigan*, J. O. Veatch et al.—Alger County, in the north-central part of the Upper Peninsula of Michigan, bordering Lake Superior, occupies 583,680 acres in the Great Lakes plains region. The county as a whole is a plain.

The soils found in the survey here noted constitute 45 types and are assembled into 38 series. Au Train loamy sand is the most extensive of the mineral soils, covering 10.8 percent of the land area of the county. Carbondale muck, the most important of the organic soils, occupies 13.1 percent.

No. 33. *Soil survey of Potter County, Texas*, E. H. Templin and A. E. Shearin—Potter County consists of 588,800 acres in northwestern Texas. "The surface relief within the Canadian River breaks [which cover the greater part of the county] is in general strongly rolling or hilly. A few interstream areas have comparatively smooth surfaces, but the greater part of the land is too rough for cultivation."

The soils found in this tract are designated as 35 percent of rough broken land, together with 20 types of classified soils grouped into 13 series. Pullman silty clay loam, "the important agricultural soil of Potter County", constitutes 11 percent of the county. Potter fine sandy loam, "generally unsuited to farm crops", takes up 10.1 percent, and a further 44.6 percent of the county lands are grouped under the head of "nonagricultural land."

No. 34. *Soil survey of Wyoming County, Pennsylvania*, B. H. Hendrickson et al.—Wyoming County occupies an area of 260,480 acres lying in the northeastern part of the State and varying in topography from rolling sections to the more rugged relief of the mountain lands. "The drainage system is of a dendritic pattern, [and] dissection is thorough."

The soils mapped and described were found to constitute 17 series, including 37 types, of which Westfield gravelly silt loam, covering 6.9 percent of the total area, is the most extensive single type. The group of soils classed as rough stony land (mainly Leetonia and Lehew stony loams), occupying 14.4 percent of the area surveyed, forms the main timber-producing section of the county.

No. 35. *Soil survey of Columbia County, Oregon*, W. G. Harper and E. F. Torgerson.—Columbia County, northwestern Oregon, has an area of 421,120 acres, of which the surface features range from those of the delta and stream-bottom lands to those of hilly and mountainous sections.

The soils are here classified as 16 series, inclusive of 21 types, together with rough mountainous land, mainly undifferentiated soils of the Olympic series, 54.5 percent. Olympic silt loam occupies 13.1 percent of the area surveyed and is "one of the most important agricultural soils."

Soil survey of Washtenaw County, Michigan, J. O. Veatch et al. (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1930, No. 21, pp. 47, pls. 2, figs. 2, map 1*).—Washtenaw County possesses an area of 456,960 acres in the southeastern part of the Lower Peninsula, level to moderately hilly, and for the most part adequately drained.

Miami loam, the most extensive type found, is ranked for general farming purposes as "first-class except on steeper slopes", and occupies 20.2 percent of the area surveyed. Miami silt loam, "first-class where slopes do not exceed 10 percent", follows with 15 percent, muck and peat occupy about 13 percent, and Bellefontaine sandy loam covers a further 12 percent. Thirty-two types are grouped into 26 series.

The survey was made in cooperation with the Michigan Experiment Station.

An optical method for mechanical analysis of soils, etc., E. G. RICHARDSON (*Jour. Agr. Sci. [England], 24 (1934), No. 3, pp. 457–468, figs. 8*).—The author describes and discusses mathematically two methods, designated, respectively, the constant time method and the constant depth method. In the first of these the light absorbed simultaneously over the entire depth of the cell in which the soil suspension is settling constitutes the quantity measured, whereas in the second, or constant depth method, the light absorbed at a given depth is determined at suitable intervals throughout the settling.

The laws of soil colloidal behavior.—XVI, The cation exchange-maximum in alumino-silicates, S. MATTSON and J. S. CSIKY (*Soil Sci., 39 (1935), No. 2, pp. 161–165, fig. 1*).—Report is made in the present installment of this serial contribution (E. S. R., 72, p. 745) from the New Jersey Experiment Stations of experiments in which "the maximum in the cation exchange capacity of aluminosilicates has been found to be at a molar ratio of about 9 mols SiO_2 to 1 mol Al_2O_3. A comparison is made with the corresponding ratio (4.2:1) of ferric silicates, and an explanation is offered on the basis of the general chemical and electrokinetic behavior of the two series."

Base-exchange equilibria in clays, C. E. MARSHALL and R. S. GUPTA (*Jour. Soc. Chem. Indus., Trans., 52 (1933), No. 51, pp. 433T–443T, figs. 2*).—In a contribution from the University of Leeds, it is indicated that when a sufficiently wide range of concentrations is chosen none of the base-exchange equations so far proposed is satisfactory.

"The clays studied were well defined mineralogically, and accurate analytical data are presented for the following reactions: Na-clay + KCl; Na-clay + $CaCl_2$; Na-clay + $AgNO_3$; H-clay + $AgNO_3$; H-clay + Tl_2SO_4. In the Na-clay + $AgNO_3$ and H-clay + $AgNO_3$ systems electrometric measurements of silver-ion activities were made, and the dissociation of silver clays in absence of electrolyte was also studied electrometrically. It was shown that bentonite (montmorillonite) has too high a dissociation to be classed as a weak electrolyte. In the H-clay + Tl_2SO_4 systems electrometric measurements of both H^+ and Tl^+ were made. The conclusions arrived at from the Ag^+ measurements were confirmed, and it was concluded that the substitution of activities for concentrations in the simple mass-action equations does not suffice to make them valid. The peculiarities of the dissociation of the clays are shown to be important and fundamental."

Base exchange and related properties of the colloids of soils from the erosion experiment stations, C. S. SLATER and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 461 (1934), pp. 20*).—As a part of an extended investigation of the soils of the erosion stations, in part previously noted (E. S. R., 72, p. 449), the authors examined 11 soils with respect to the compounds dissolved from the colloids of the various horizons by 0.05 N hydrochloric acid, the base-exchange phenomena of the residual material, and those of the organic matter content. The types upon which these experiments were made were Nacogdoches fine sandy loam, Cecil sandy clay loam, Kirvin fine sandy loam, Muskingum silt loam, Palouse silt loam, Vernon fine sandy loam, Shelby silt loam, Clinton silt loam, Marshall silt loam, Houston back clay, and Colby silty clay loam.

Silica, alumina, and iron oxide were extracted from the colloids in ratios markedly different from their relative quantities in the original material. It is noted particularly that the lateritic soils, though high in iron content, yielded essentially no soluble iron. The inference is drawn that, especially in grassland soils, free soluble silica is present in the surface horizons. The

quantities of the exchangeable bases, including manganese, varied widely with the character of the soils. The proportions of the different bases varied with the character of the soil, and often within a particular profile. There was found, in most cases, a fairly definite relation between the total exchangeable bases and the base-exchange capacity and the silica: sesquioxide ratio. The total exchange base content of the colloids of the 11 soil profiles ranged from a minimum of 4.2 milliequivalents per 100 g in the C horizon of Cecil sandy clay loam to 144.6 m. e. in the subsoil of the Houston clay. The base-exchange capacities of the colloids are, as a rule, greatest for the A horizons in all profiles when the organic matter is present, but when the organic matter is removed the base-exchange capacities show uniformity to a striking degree in each profile. This uniformity is not shown by the slightly weathered profile of Muskingum silt loam. The values range from 9.7 m. e. for the Cecil C horizon to a maximum of 88.1 for the subsoil of Houston clay.

A large part of the organic material of the colloids could be extracted by ammonia, and the base-exchange capacity was determined on the material extracted as well as on the organic-free colloids. The organic colloids had very high base-exchange capacities as compared with the organic-free colloid. The values obtained for the base-exchange capacity of the ammonia-soluble organic matter showed only the relatively narrow range of from 324 for Clinton silt loam to 394 for Vernon fine sandy loam.

The mineral content of soil types as related to "salt sick" of cattle, O. C. BRYAN and R. B. BECKER (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 120–127, fig. 1*).—Of 40 Florida range soils 23 caused the salt sick condition of cattle, these consisting of 21 mineral soils and the sands and fine sands of the Leon, Portsmouth, Dade, and Norfolk series, and two organic (Everglades peat) soils.

The healthy range soils consisted of the sandy loams and sands of the Bladen, Fellowship, Hernando, Gainesville, and Orangeburg soils, and such Norfolk soils as have sandy loam or clay subsoil. The surface soil of the healthy ranges contained approximately 10 times as much iron, twice as much copper, 5 times as much phosphorus, and 5 times as much calcium as did those of the salt-sick areas. The organic soils contained relatively higher amounts of calcium, iron, and copper than did the mineral soils, but the iron and copper were apparently less available than in the mineral soils, and they were subject to the salt-sick condition. "Cattle will develop salt sick on soils with 0.036 percent of iron and 3.85 p. p. m. of copper, while they remain healthy upon soils with 0.42 percent of iron and 8 p. p. m. of copper. Additions of copper sulfate to the salt-sick soils increased the growth of mustard under controlled conditions."

Studies on the microbiology of grassland soil.—Part I, General chemical and microbiological features, W. G. E. EGGLETON (*Jour. Agr. Sci. [England], 24 (1934), No. 3, pp. 416–434, figs. 7*).—In this investigation pasture soil at Jealott's Hill, Berkshire, was found to be characterized by a relatively high ammonia and low nitrate-nitrogen content during the main growing period (May–September). Applications of ammonium sulfate raised the ammonia and nitrate-nitrogen levels, but ultimately lowered them. The effect of irrigation during the spring, when the soil-moisture content was high, was to depress the ammonia and nitrate-nitrogen levels, but during the dry summer months and subsequently the levels were appreciably raised by this treatment. A small though definite periodic change in the reaction of normal grassland soil took place during the season, the soil being most acid during the summer.

Added ammonium sulfate slightly accentuated the change, and the return to normal in the autumn was not quite complete.

Further, "bacteria and *Actinomyces* were present in much greater numbers (50–60 millions/g dry soil) during the period April/May than at any other time of the year. The numbers were depressed (10–20 millions) during the hot summer months, owing to the lack of moisture, but increased again (30–40 millions) with the moisture soil conditions in September. During the winter the numbers fell to approximately the summer levels. The fungal counts, on the other hand, were much higher in the autumn than in the spring. . . . Although numbers of bacteria and *Actinomyces* were depressed during summer, the latter appeared to be relatively more tolerant of dry conditions, in that their proportion increased at this time. Lack of moisture in the summer was accompanied by an increase in the number of fungal spores, but a decrease in the number of *Actinomyces* spores. The effect of nitrogen added in the form of sulfate of ammonia on numbers of bacteria and *Actinomyces* is small in comparison with the marked influence of moisture and temperature. During the relatively dry summer months, irrigation maintained numbers of bacteria, *Actinomyces*, and fungi at a definitely higher level.

"The evidence so far available indicates that in grassland soils the upgrade and downgrade processes of the nitrogen cycle are no different in nature from those in arable soils, but the level of intensity of these processes is higher. Owing to the different conditions in grassland soils—especially the plentiful supply of organic matter derived from the dense mass of roots and herbage debris—the population of micro-organisms is greater and the fluctuations in their numbers are more rapid and intense."

Characteristics of certain bacteria belonging to the autochthonous microflora of soil, H. J. Conn and M. A. Darrow (*Soil Sci., 39 (1935), No. 2, pp. 95–110*).—The authors of this contribution from the New York State Experiment Station report an investigation into the physiology of certain soil organisms previously found to produce punctiform colonies on laboratory media (E. S. R., 54, p. 621), giving special attention to *Bacterium globiforme* (E. S. R., 60, p. 420), which has been shown to be readily recognizable and to be more numerous in highly productive than in less productive soils.

In the liquid media in which they were grown, the organisms studied (*B. globiforme* and associated forms) appeared to convert all of the carbon of glucose or sucrose into carbon dioxide and cell substance.

B. globiforme, when growing on a solid medium containing 0.1 percent ammonium phosphate as its sole source of nitrogen, consumed from 60 to 90 percent of the nitrogen thus furnished, and from 70 to 80 percent of that consumed was converted into cell substance. The rest of the nitrogen remained after growth in the medium, no loss of nitrogen being evident.

"It is concluded that these bacteria undoubtedly help retain in soil nitrogen that has been converted by other organisms into a soluble form and, but for the action of this autochthonous micraflora, would probably be removed by drainage or utilized by plants. It is still uncertain whether to regard these organisms as ordinarily harmful or beneficial. Perhaps they may be either, according to the conditions under which they are functioning. At times they may be rivals for nitrogen because of their ability to utilize nitrate. On the other hand, under conditions that bring about rapid nitrification in the soil these bacteria may be beneficial. When ammonification is so rapid that ammonium salts tend to accumulate faster than they can be nitrified or nitrates are formed more rapidly than they can be utilized by the plants, there would

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be considerable loss of nitrogen by leaching but for the action of bacteria in converting it into an insoluble form.

"Of these two functions it seems more probable that the beneficial action predominates, to judge from the fact that this group of organisms is ordinarily most abundant in the better soils. Whether ordinarily harmful or beneficial, it is plain that the organisms studied are well adapted to live under surface soil conditions, as they are very strictly aerobic, can make use of nitrates, ammonium salts, or amino compounds as sources of nitrogen, and can obtain their carbon and energy from such small amounts of sugar that they can undoubtedly utilize for this purpose the minute quantities made available in soil during the digestion of starch and cellulose. Utilizing simple sources of nitrogen and very small quantities of carbohydrate, they convert inorganic material into cell substance which, undoubtedly, is readily converted into humus upon the death of the bacteria."

One aspect of the interrelation of soil bacteria and plant growth, N. A. Clark (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 100–103*).—The author grew *Lemna* spp. in an inorganic salt solution culture and in the absence of micro-organisms for several years, and compared this material with that of the same plant from a soil water, nonsterile culture with respect to vitamin A efficiency. Dried material from each culture was included in a diet, complete except with respect to vitamin A, in the proportion of 0.5 percent dry weight. Xerophthalmia, markedly developed in the rats used before the *Lemna* material was added to the diet, was cured, and growth was reestablished. An approximately equivalent feeding of the fresh plant was slightly more effective than the dried material.

"In these experiments the absence of the micro-organisms and the variation in light have had little influence on the formation of vitamin A in the *Lemna*. But vitamin A is probably not produced to any extent by bacteria, and for other vitamins there might be quite different results."

The rhythmical nature of microbiological activity in soil as indicated by the evolution of carbon dioxide, F. B. Smith, P. E. Brown, and H. C. Millar (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 104–108, figs. 3*).—The rate of carbon dioxide production in soils decreased rapidly during the first 1 to 3 days of incubation in the laboratory. The initial period of decreasing rate of production was usually followed by regular fluctuations between high and low rates of production in a repeating cycle. A statistical analysis of the data showed that these fluctuations were not merely chance variations, but that there was a significant tendency toward a rhythmical periodicity in production of carbon dioxide in the soils. The data obtained showed no correlation between the amount of carbon dioxide produced during the day or at night and the periods of high rate of production. "There were rather definite cycles between the periods of high and low rates of production, [but] there can be no doubt the 12-hr. intervals were too long to define these periods accurately.

"There is no experimental evidence for the assumption that there are periodic variations in the rate of respiration of the organisms. However, the amount of carbon dioxide produced during the various phases of growth in a bacterial culture might vary. That is, during the logarithmic growth phase, more carbon might be required for the metabolism of cells and a smaller proportion used for energy but with an increasing number of cells respiring. During the logarithmic death phase a larger proportion of carbon might be used for energy purposes than for cell metabolism, but there are also a decreasing number of cells to respire during this phase. Even if this were the explanation of the phenomena, it would be difficult to conceive of a mixed culture of soil micro-organisms hav-

ing generation time and metabolic processes sufficiently similar to produce regular periodic fluctuations in the rate of carbon dioxide production."

The decomposition of lignin and other organic constituents by certain soil fungi, F. B. SMITH and P. E. BROWN (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 109–119, figs. 5*).—In the investigation reported upon in this contribution from the Iowa State College, lignin, xylan, and cellulose extracted from an oat straw, a "calcium lignin", and an "oxidized lignin", as well as H-lignin, were used, together with oat straw itself, as sources of carbon for certain common soil molds. The calcium lignin and the oxidized lignin were used as sources of carbon for comparison with H-lignin for *Stereum purpureum* in a sand culture medium. H-lignin was found to be very resistant to aerobic decomposition but was slightly decomposed by a soil infusion in solution cultures and by *S. purpureum* in a sand culture medium. The oxidized lignin was less resistant to decomposition by *S. purpureum* than H-lignin. It is concluded that lignin does not possess antiseptic properties, and, though it may decompose slowly, it gradually disappears from soils.

Peat (*Alaska Col. Sta. Bul. 3 (1933), p. 3*).—This report contains a brief note on a field plat comparison of peat, peas, and sodium nitrate as sources of nitrogen for wheat.

Effect of sunlight on the nitrification of ammonium salts in soils, G. S. FRAPS and A. J. STERGES (*Soil Sci., 39 (1935), No. 2, pp. 85–94*).—The authors were unable to demonstrate in Texas soils the photochemical nitrification observed by Dhar et al. (E. S. R., 70, p. 16) in India, finding, on the contrary, that nitrification in sterilized soils occurred neither in the light nor in darkness except in the case of one soil, of which it is stated that it "was probably not completely sterilized."

It is further stated that "although this work does not entirely exclude the possibility of photonitrification, it shows not only that photonitrification must be of little or no practical importance but also that sunlight greatly decreases the nitrification caused by bacterial action when the bacteria are directly exposed to the sunlight. Since only a small portion of the soil is exposed to direct sunlight, the destructive action of sunlight upon nitrifying organisms is not likely to be of agricultural importance."

Investigations of the manurial effectiveness of ammonium phosphate.—Part I, Introductory and historical, A. H. LEWIS and K. J. SINCLAIR (*Empire Jour. Expt. Agr., 2 (1934), No. 6, pp. 154–162*).—"The aim of this series of papers is to compare the relative fertilizer effectiveness of concentrated fertilizers based on ammonium prosphates with that of ordinary mixtures." The present paper is confined to a discussion of the theoretical advantages and disadvantages of ammonium phosphates, and to a survey of the literature dealing with results of experiments in which the effects of ammonium phosphates on growth and yield are compared with those of equivalent low-analysis mixtures.

Inorganic phosphate in green plant tissue as a measure of phosphate availability, H. D. CHAPMAN (*Soil Sci., 39 (1935), No. 2, pp. 111–122*).—In the vegetative stages, oats limited in growth by insufficient phosphate were found by the author of this contribution from the University of California to be exceedingly low in inorganic phosphate in all parts of the plant. When not limited by phosphate deficiency, much higher quantities were found in the green plant. This same condition was found in Lisbon lemon cuttings grown in culture solutions. Applications of phosphate fertilizer greatly increased the absorption of phosphate by oat plants. All parts of the plant showed this effect in the vegeta-

tive stages, the embryonic, conductive, and storage tissues being most markedly affected. Apparently as a result of translocation and transformation changes within the oat plant, these relations were not nearly so pronounced at later growth stages.

Nitrogen deficiencies were found to cause inorganic phosphate to accumulate within the oat plant, even in soils which were deficient in phosphate, and "marked accumulations of inorganic phosphate have been found in the leaves and stems of citrus branches affected with the physiological disease known as 'mottle leaf.' It is probable that physiological disturbances produced by various other conditions may also cause inorganic phosphate to accumulate within the plant. Although subject to the limitations noted . . ., the method, if worked out in sufficient detail for different plants, may prove very useful."

A response of chlorotic corn plants to the application of zinc sulfate to the soil, R. M. Barnette and J. D. Warner (*Soil Sci., 39 (1935), No. 2, pp. 145–159, pls. 2*).—Corn plants affected with 'white bud", a form of chlorosis, responded to a 20-lb. per acre application at the Florida Experiment Station of "chemically pure" zinc sulfate ($ZnSO_4.7H_2O$) with a mixed inorganic fertilizer and with alkaline peat in the soil. The chlorotic plants regained their green color, made a healthy growth, and produced grain following the application of zinc sulfate.

It was also observed that "stable manure and leaf mold produced healthy corn plants in an affected soil. Chicken manure and alkaline peat brought about a definite improvement in affected plants but did not cause a complete removal of white bud symptoms. Qualitative spectroscopic tests on the ashes of these organic materials showed the presence of zinc."

The value of gypsum as a supplement to a concentrated fertilizer, L. G. Willis (*North Carolina Sta. Bul. 299 (1934), pp. 9, figs. 3*).—In addition to its stated subject, this bulletin deals with root injury caused by concentrated fertilizers.

Small quantities of gypsum added to a concentrated fertilizer brought its efficiency up to that of the materials more commonly used. It appeared that ordinary fertilizers may provide more gypsum than is needed when used in large applications, thus increasing the leaching loss of potassium and magnesium.

"Ground limestone does not immediately prevent the injury caused by the concentrated fertilizer.

"The calcium- and sulfur-free concentrated fertilizer produced cotton crops equal to those produced with ordinary fertilizers on soils previously receiving heavy applications of the latter.

"On depleted soils, low yields with concentrated fertilizers are associated with root injury caused by some ingredient of the fertilizer, probably the ammonium compounds. This injury is not systemic. The low yields may result from interference with the absorption of normal supplies of water or nutrients supplied by the soil."

Some potential changes induced by liming suspensions of a peat soil, L. G. Willis (*North Carolina Sta. Tech. Bul. 47 (1934), pp. 16, figs. 3*).—The author infers, in part, that the potentials of suspensions of a peat soil in equilibrium with air drift toward the negative until full microbial activity is established. The drift is most rapid at the higher pH values. At equilibrium the slope of the potential/pH curve is approximately —0.06. Equilibrium potentials are maintained by oxygen and some lower potential component in the soil. An air-dried peat soil has a higher potential than one in which micro-organisms are active. Soil organic matter as represented by the humus fraction of a peat soil constitutes an oxidation-reduction system having a

potential/pH curve with a slope of —0.06 in the acid range and a zero slope in the alkaline range. In the absence of oxygen, the potential of the peat-soil suspension reaches an extremely negative value. This is approached most rapidly at the higher pH values. A soil subject to depletion of oxygen will develop abnormally low potentials when given any treatment that will stimulate the activity of micro-organisms.

Inspection of agricultural lime products, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 76 (1934), pp. 8*).—Calcium and magnesium as oxides and the proportion of the total oxides present in the form of carbonates are reported, together with the neutralizing value in terms of calcium oxide.

The possible importance of supplying magnesium is recognized in the direction that "in cases where indications of magnesium deficiencies in the soil have been noted through a lack of green coloring matter in the leaves, or a whitening of the leafy structure of plants, a lime product high in magnesium oxide should be selected."

Inspection of commercial fertilizers, H. D. HASKINS (*Massachusetts Sta. Control Ser. Bul. 74 (1934), pp. 54*).—This bulletin contains the usual report on fertilizer analyses, covering the season of 1934. It contains also a brief discussion of acid and basic fertilizers, giving the definitions of acid-forming and nonacid-forming fertilizers as tentatively stated by the committee of the Association of Official Agricultural Chemists of North America, and adds a definition of a basic fertilizer as one which decreases the acidity of the soil upon which it is used; pointing out also the advantages of finely ground dolomite over limestones of high calcium content for use as a basic filler or conditioner. It is noted, however, that "the fact should not be ignored that in many instances an acid-forming fertilizer is preferable to a basic mixture, and, in general, it may be said that an acid-forming fertilizer is not such a great problem to the farmer who has become accustomed to making direct lime applications to his soil when needed."

AGRICULTURAL BOTANY

The life forms of plants and statistical plant geography, being the collected papers of C. Raunkiaer, trans. by H. GILBERT-CARTER, A. FAUSBØLL, and A. G. TANSLEY (*Oxford, Eng.: Clarendon Press, 1934, pp. XVI+632, pl. 1, figs. 189*).—In this work, 16 important articles dealing with life forms in relation to plant distribution are translated from Danish, French, or German into English, in order that these valuable contributions to plant ecology may be more widely accessible to scientific workers and students. The first chapter is devoted to the author's original classification of biological types and is followed by his amplification of these concepts with the presentation of characteristic examples of life forms illustrated by clear drawings. His scheme of analysis of dominant climatic relations is shown by means of hydrotherm charts. One chapter is devoted to the presentation of the statistical methods by which plant formations and vegetational relations may be recorded on a quantitative basis.

The major portion of the volume includes papers presenting the results of the author's studies on the interrelations of environmental factors and vegetational types in different parts of the world, representing distinctly different ecological situations. An interesting chapter is devoted to the use of leaf size in biological plant geography. The final chapter is devoted to hitherto unpublished botanical studies in the Mediterranean region.

On the protection of high mountain, perennial plants by the persistence of foliar organs [trans. title], J. BOUGET and A. DUSSEAU (*Rev. Gén. Bot., 46 (1934), No. 544, pp. 193–199*).—A study of various typical perennials at the summit of Pic du Midi de Bigorre in the Pyrenees shows that the role of the persistent foliage is distinctly different in plants of the "tunicagrass" and cushion types, both of which have heretofore been considered adapted, as are desert plants, to withstand dryness of the atmosphere and soil. The persistent foliage plays a xerophilous rather than a thermophilous role in the tunicagrasses, but plants of the cushion type are protected as effectively against cold, wind, snow, and ice as against desiccation.—(*Courtesy Biol. Abs.*)

On the regulation of the length of the vegetation period of plants [trans. title], N. A. MAKSIMOV (MAXIMOV) (*Trudy Prikl. Bot., Genet., i Selek.* (*Bul. Appl. Bot., Genet., and Plant Breeding*), *3. ser., No. 3 (1933), pp. 3–16; Eng. abs., p. 16*).—The author gives a survey of the latest works on the subject, referring to the contributions of W. W. Garner and H. A. Allard, of A. S. Rasumov on photoperiodism, and of T. D. Lyssenko on vernalization. Coordination of all agricultural physiological research under one directing center is urged for the more successful working out of the most important problems of agriculture.

Photoperiodism in species of woody plants: Preliminary contribution [trans. title], P. BOGDANOV (P. L. BOGDANOFF) (*Trudy Issledov. Lesnomu Khoz. Lesnoi Promysh.* (*Mitt. Staatsinst. Wiss. Forsch. Geb. Forstw. u. Holzindus.*), *No. 10 (1931), pp. 21–55, figs. 6; Ger. abs., pp. 54, 55*).—This is an initial report on investigations, conducted in the dendrological research nursery of the State Institute for Scientific Investigation in Forestry and Wood Technology in Leningrad, dealing with photoperiodism in trees and its significance in acclimatization. The work was started with 1- or 2-year-old seedlings of broadleaved and coniferous species, partly exotic and partly natives, thriving well in the region. The plants were grown outdoors in the ground and covered with lightproof boxes as required to shorten the light period. Some were given normal daylight, some were given daylight for 13 hr., and some for 9 hr. each day. In the first year the curtailment of light for the short-day plats extended throughout the vegetative period. In the second year the daylight shortening was started about mid-July.

The shortening of the daylight period affected all species used in the same direction, although some experienced stronger effects than others. Shortening of the daylight period during the second half of the summer resulted in shortening the vegetative period. Seedlings grown under shortened daylight emerged earlier, sometimes 10 days earlier, the next year. The species suffering but little reduction in vegetative period with daylight shortening matured at the usual time, under normal conditions, and survived the winter well in contrast to the danger of freezing met with in those which responded by marked reduction in the vegetative period.

Larches from southern latitudes, where shorter daylight periods prevail, showed very late growth. With shortened periods, these stopped growth about 6 weeks earlier. The southern forms of the common pines proved very sensitive to length of day. The seedlings of these, grown under normal daylight, made scanty development and were injured by the winter cold, while those grown under shortened day length stood the winter well.

Influence of X-rays on seeds and pollen of trees and shrubs [trans. title], I. NIKITIN (*T͡sent. Nauch. Issledov. Inst. Lesn. Khoz. Sborn. Trud.* (*U. S. S. R. Cent. Forestry Res. Inst. Bul.*), *No. 1, (1934), pp. 86–104, figs. 4; Eng. abs., pp. 103, 104*).—The irradiation of *Betula alba* and *B. verrucosa* seeds by Coolidge

tube X-rays increased their germination percentage. Without filters the optimum stimulation was secured in 5 min. X-rays depressed the germination of *Pinus sylvestris* and *Picea excelsa*. The pollen of certain shrubs was stimulated and that of others retarded in germination by irradiation. Air-dried pollen of *Philadelphia caucasica* was injured by exposure to X-rays.

Artificial cultures of corn root tip meristems [trans. title], R. GAUTHERET (*Compt. Rend. Acad. Sci.* [*Paris*], *197* (*1933*), *No. 1*, *pp. 85–87*).—A method of growing root tips and other root fragments of *Zea mays* in artificial culture is described. The basic medium used was Knop's solution slightly diluted. To this medium was added 2 percent glucose and a small quantity of cysteine chlorhydrate, the latter material particularly stimulating growth.

Culture of root tip meristematic tissue from the original fragment was maintained for nearly 3 mo. Repeated culture of the growing tip resulted in a slenderer root tissue until the meristematic tissue was unable to develop anything but undifferentiated cells. A study of this tissue reduction produced evidence that the meristematic tissue of the root tip is capable of producing largely the rootcap cells, or perhaps also the large cells of the plerome, but otherwise it has nothing to do with vascular differentiation.

Root fragments with the growing tip removed were able to regenerate a new growing tip if the section was made near the original tip. A scar tissue is first formed, and normal growth follows. When the tip was not regenerated, the remainder of the root continued its normal growth, with the accompanying differentiation of cell elements.—(*Courtesy Biol. Abs.*)

Glutamine in the tomato plant, H. B. VICKERY, G. W. PUCHER, and H. E. CLARK (*Science*, *80* (*1934*), *No. 2081*, *pp. 459–461*).—Tomato plants grown at the Connecticut [New Haven] Experiment Station in sand cultures that provided nitrogen in the form of ammonium salts stored glutamine, particularly in the stems, in quantities of from 2 to 3 times as great as control plants provided with nitrogen in the form of nitrates. They likewise contained somewhat more than twice as much free ammonia as the control plants. Growth was, however, much more luxuriant on the nitrate solutions.

Glutamine can therefore serve as a means for the detoxification of ammonia in a mature plant, and plays the chief part in this connection in the tomato plant.

The chemical methods used in the isolation and determination of the amide nitrogen are described.—(*Courtesy Biol. Abs.*)

Growth inhibition of potato by volatile gas from apple fruits, O. H. ELMER (*Kansas Sta. Bien. Rpt. 1933–34*, *pp. 98, 99*).—The work conducted on potato plants and sprouting potatoes with a volatile substance from apple fruits and with ethylene is briefly summarized.

The effect of inositol, crystalline vitamin B, and pantothenic acid on the growth of different strains of yeast, R. J. WILLIAMS and D. H. SAUNDERS (*Jour. Biol. Chem.*, *105* (*1934*), *No. 2*, *Proc.*, *pp. XCIX, C*).—In tests at the Oregon State College with strains of so-called *Saccharomyces cerevisiae*, the results conclusively indicated that no single substance was wholly responsible for yeast growth stimulation. The three referred to in the title were found to play important roles, of which that of pantothenic acid was outstanding.

A device for measuring intensity of illumination, H. R. ROSEN and W. M. ROBERDS (*Science*, *78* (*1933*), *No. 2020*, *pp. 241, 242*).—This contribution from the Arkansas Experiment Station describes a home-made device for measuring intensity of illumination in connection with plant studies. It involves a Weston photronic cell and a Weston galvanometer, with switches and connections.

illumination intensities from 10 to 15,000 foot-candles may be measured accurately.

A stain for difficult plant material, P. Stockwell (*Science, 80 (1934), No. 2066, pp. 121, 122*).—A stain which is being used for most of the cytological work in the author's laboratory is described and its use outlined. The proportions are 1 part of 1 percent aqueous gentian violet, 2 parts of 1 percent safranine, and 1–4 parts of distilled water. The stain has proved extremely selective, the chromosomes in different stages taking up varying shades of color, usually purple, the spindles becoming a different shade of purple, the nucleoli red, and the cytoplasm orange-yellow.

GENETICS

The chromosomes of Lilium (*Lily Year-Book, 3 (1934), pp. 35–45, figs. 7*).—Part 1 of this paper, by D. Hall, deals with the significance of chromosomes in plant breeding. Part 2, by K. Mather, and part 3, by E. R. Sansome and L. La Cour, discuss chromosome numbers and their behavior.

Comparative metabolism of the cells of various chromosomal types of Nicotiana tabacum, J. Dufrenoy (*Calif. Univ. Pubs. Bot., 18 (1935), No. 1, pp. 22, figs. 16*).—The results are discussed of preliminary studies conducted at the University of California comparing the metabolism of the vegetative and reproductive cells of tobacco affected with chromosome irregularities with that of normal cells. It is held that cell metabolism depends upon genetic constitution, and that any change of metabolic activity, such as that due to changes in the chromosome situation, may be manifested by a remodeling of cell structure or regrouping of cell constituents like mitochondria or plastids. Distinctive alterations found to be associated with particular chromosomal types are described in detail, and the theoretical implications are presented.

Inheritance of rye crossability in wheat hybrids, J. W. Taylor and K. S. Quisenberry (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 149–153*).—Crossability of wheat with rye behaved as a heritable character that could be transferred to wheat segregates by hybridizing wheat and rye. By this method a strain similar to wheat was produced which, in addition to crossability with rye, gave two F_1 hybrids showing some anther dehiscence and one of which produced a selfed seed. Transferring the rye crossability present in known varieties of wheat to more desirable wheat segregates by intervarietal crossing was readily accomplished. The results confirmed the preliminary report of Backhouse (E. S. R., 37, p. 432), who pollinated 17 F_2 plants of a crossable × noncrossable wheat and found four that set seed. Although the numbers were small in both cases, crossability appeared to be controlled by a main recessive genetic factor, with the possibility that minor modifying factors might also be present.

Bacterial dissociation, H. J. Conn (*Pure Cult. Study Bact., 1 (1933), No. 7, pp. 21–24*).—In this contribution from the New York State Experiment Station, the author discusses the problem created by mutants and variant forms in connection with pure culture studies.

[Experiments in animal genetics by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 86, 89–93*).—Brief reports are given of the following investigations: Inheritance of crooked keel bones in chickens; heritability of variations in eye color and plumage surface color, under color, and amount of black in the flight feathers of chickens; linkage tests in which 34 factors were found to be independently inherited except for silky and flightless, and dominant

white and crest, which were linked; inheritance of a new genetic character, "frayed", in poultry; vigor and characteristics of birds produced by mating crossbred Rhode Island Reds and Barred Plymouth Rocks with White Leghorn females; and vigor of hybrids from crosses of various breeds, by D. C. Warren; production of guinea pigs recessive for 13 different genes for use in linkage tests; the influence of environmental factors on birth weight in guinea pigs; the operation of a dominant gene inhibiting the expression of black spotting in cattle; inheritance of a dominant modifier of recessive white spotting in Guernseys; and the inheritance of susceptibility to acute mastitis, together with other genetic factors in cattle, by H. L. Ibsen; and the inheritance of various characters in the grouse locust and the influence of climatic conditions on the appearance of these characters, by R. K. Nabours.

[**Experiments in animal genetics in Oklahoma**] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 86–94, 129, 130, figs. 4*).—A brief report is given by W. A. Craft on the comparative weights, litter size, mortality, feed consumption, hemoglobin per 100 cc of blood, and polymorphonuclear leucocyte count in outbred pigs and pigs inbred by half-brother and half-sister matings for 4, 5, and 6 generations; by Craft and W. L. Blizzard on semihairlessness in cattle; by Craft on the inheritance of swirls in swine and the character "short sacrum" in swine; by L. Morris and R. B. Thompson on the effect of crossbreeding on hatchability, viability, rate of growth, egg production, and other factors; and by Morris on beak deformities in poultry and the inheritance of open or loose wings in Barred Plymouth Rocks.

Albinotic dilution of color in cattle, L. J. Cole, E. E. Van Lone, and I. Johansson (*Jour. Heredity, 25 (1934), No. 4, pp. 145–156, figs. 6*).—The occurrence in two herds of cattle which were practically devoid of pigment at birth but developed some pigment in the iris and hair, making a "ghost-pattern", is described.

Matings were made at the Wisconsin Experiment Station of a heifer and a bull to black and white and red and white segregates from a Holstein-Angus cross and to a red-roan Shorthorn bull. All calves were black and white, suggesting that the extreme reduction in pigment was due to a recessive to normal pigmentation and that the cattle carried black. An inter se mating between the albinos produced an albino calf.

Aside from a pronounced photophobia, and poor breeding behavior in one bull, there were no signs of decreased vitality in the mutants.

Studies on crossing Mangalitza and Large-Black breeds [trans. title], G. K. Constantinesco (*Ann. Inst. Natl. Zootech. Roumanie, 3 (1934), pp. 13–34, figs. 19*).—An analysis of the inheritance of the contrasting color and marking characteristics of 24 F_1 and 15 F_2 pigs from these breeds showed that the black color of the Large-Black was dominant to the light color of the Mangalitza. The F_2 generation segregated into reddish, sable, and yellow. Definite evidence was obtained to prove that the stripes were inherited independently of the color factors, but the exact mode of inheritance was not clear. A factor from the Mangalitza breed diluted the black of the Large-Black breed.

The operation of multiple factors for conformation presented an intermediate type of inheritance for each part, whereas the oblique rump of the Mangalitza breed behaved as a dominant.

Kinky tail in swine, J. E. Nordby (*Jour. Heredity, 25 (1934), No. 4, pp. 171–174, figs. 3*).—A condition designated as kinky tail, caused by rigid angles resulting from fusion of the vertebrae, is described from the Idaho Experiment Station. Observations on several litters suggest that the character is due to a single recessive factor working in the presence of inhibitory influences.

If the vertebrae are fused end to end, affected animals appear normal and the ratios are modified.

Analysis of a case of mosaicism in the house-mouse, L. C. DUNN (*Jour. Genet., 29 (1934), No. 3, pp. 317–326, pl. 1*).—An analysis is given of certain phases of the color genotype of a black male mouse spotted with small areas of light tan on the back and head. Matings showed this mosaic to be nonagouti (*aa*), but three types of genes in the albino series were transmitted in the proportion $4c^r : 5C^+ : 1c^-$. The c^- gene was nonlethal and did not involve sufficient deficiency to include the shaker gene linked with the albino series of allelomorphs. Normal albinism (c^a) was shown to differ from c^- in combinations with c^r. Individuals c^rc^- were lighter in color than c^rc^a individuals. Evidently the mosaic resulted from a mutation from C^+ to c^- in a pregonial cell. A study of the spotting genes showed that the mosaic was *wwSs*.

Modification of hair direction and slope on mice and rats (Mus musculus and Mus norvegicus albinus), L. T. DAVID (*Jour. Expt. Zool., 68 (1934), No. 3, pp. 519–528, fig. 1*).—Studies of the factors influencing the direction and slope of the hair growth of mice and rats are reported from the [Connecticut] Storrs Experiment Station.

By suturing folds in the skin of mice from 1 to 2 days of age, changes in the stress resulted in modifications in the direction of hair growth. Reversing pieces of skin in grafts after the hair follicles had developed brought about changes in the direction of the stress, and these resulted in changing the position of the hair follicles and caused modifications in the direction and slope of the hair. The position of the graft on the animal and its size were important influences on the amount of stress developed aud the resulting modifications in hair direction and slope.

A dwarf mutation in the rat, W. V. LAMBERT and A. SCIUCHETTI (*Science, 81 (1935), No. 2098, p. 278*).—An account is given of the inheritance of a mutation for dwarfism in the rat, at the Iowa Experiment Station. In 12 litters in which dwarfs occurred there were 80 normals to 22 dwarf offspring, suggesting the operation of a simple autosomal recessive character.

In the dwarf animals there was a general reduction in body size, so that the mature weight of dwarfs was approximately 50 percent of that of normal males and 70 percent of that of normal females.

Dwarf animals were sterile, weaker than normal, more susceptible to infections, and shorter lived than normals.

Genetics of the Dutch coat pattern in rabbits, W. E. CASTLE (*Jour. Expt. Zool., 68 (1934), No. 3, pp. 377–391, pls. 4*).—In a further analysis of the genetics of the rabbit (E. S. R., 68, p. 751) English-Dutch rabbits of the constitution $En\ du^w.du^d$, mated with white Dutch rabbits ($du^w.du^w$), produced 187 English-Dutch and 198 dark Dutch progeny. All of the former which had dark eyes showed the linkage of English with the white Dutch genes, whereas all of the latter had dark eyes excepting one individual. The analysis of these results indicates that the du^w and du^d genes are allelomorphic or closely linked, as only two types of progeny expected under such a hypothesis were produced.

The grade distribution of the dark Dutch young is discussed. The one non-English-white Dutch individual was considered to be due to a crossover between the *En* and du^w genes. It is considered that the tan Dutch race carries the du^w gene, and the Vienna white gene produces a Dutch pattern.

A physiological analysis of the barred pattern in Plymouth Rock feathers, G. MONTALENTI (*Jour. Expt. Zool., 69 (1934), No. 2, pp. 269–345, pls. 7, figs. 8*).—A study of the barred Plymouth Rock feather pattern, in experiments at the University of Chicago and the University of Roma, showed a

definite relation to exist between the width of the black and white bars and the actual rate of growth of the feather. The more rapidly growing feathers have the wider bars.

The synchronism of the black and white phases in different features of the same tract excludes the hypothesis that barring is determined by endocrine conditions and indicates that it is more probably determined by the direct action of the genes in each follicle.

The more rapidly growing feathers showed smaller amounts of white than the slower growing feathers or parts of feathers, indicating the importance of the threshold of reaction.

The formation of bars was studied in the feather germ, in which they have different shapes than in the full-grown feather.

Since the follicles operate independently, no hormonal action seems directly responsible for the formation of white and black. A linkage between barbule formation and pigment pattern exists in normal conditions, as white bars exhibit larger barbule zones than black bars.

Subcutaneous injections of thyroxin induced in the dorsal feathers of the male not only barbule formation but disturbances in the rhythm of the pigmentation process, causing irregular widths of the bands.

It is concluded that the Mendelian explanation of barred plumage pattern is quite satisfactory.

A chemical and X-ray study of "flightless" feathers, H. W. Marlow and M. J. Caldwell (*Jour. Heredity, 25 (1934), No. 7, pp. 265–268, figs. 2*).—Chemical analyses of the feathers from normal and flightless birds at the Kansas Experiment Station, as described by Warren (E. S. R., 69, p. 31), showed that the cystine sulfur was 22.7 percent higher in the feathers of normal birds, while the phosphorus in the normal feathers was less than half that in the feathers of the flightless birds.

X-ray examination showed the normal feathers to be well fibered, as contrasted with the slightly fibered flightless feathers. In the normal feather the micelles are very long and narrow and lie parallel to each other and to the feather.

Concerning gonadotropic substances in mare serum, H. H. Cole and G. H. Hart (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 370–373*).—Studies of gonadotropic properties of mare serum at the California Experiment Station showed that when serum from nonpregnant animals was administered to immature rats with the synergistic substance used by Evans et al. (E. S. R., 69, p. 511), as much response was obtained as with serum from pregnant mares. It is suggested that nonpregnant serum contains a single substance which, when mixed with the synergistic substance, gives a reaction on the immature ovary, whereas the pregnancy serum contains two substances, one effective alone or with the pituitary of the recipient and the other effective only when mixed with the pituitary synergist.

Reaction of the anterior pituitaries of immature female rats to injection of pregnancy urine extracts, J. M. Wolfe (*Amer. Jour. Physiol., 110 (1934), No. 1, pp. 159–164*).—Data are presented for 31 female rats which receive from 7 to 15 daily doses of from 25 to 75 units of pregnancy urine as compared with 33 controls. The weights of the ovaries and pituitaries of the treated animals were increased to an average of 71.4 and 3.9 mg, respectively, as compared with 19.3 and 2.7 mg for the controls. The ovaries of the treated animals contained many large corpora lutea and follicles. Histological changes in the anterior pituitary, resulting from the treatment, involved enlargement of the basophiles and loss of granules.

Pregnancy cells in rat pituitary: Influence of lipoidal corpus luteum extract, H. A. CHARIPPER (*Soc. Expt. Biol. and Med. Proc.*, *32* (*1934*), *No. 2*, *pp. 402–404*).—Fifteen daily injections of 0.5 cc of lipoidal extract of corpus luteum was found to bring about the changes in the cells of the anterior pituitary of male and female rats characteristic of pregnancy.

***The* repair of the reproductive system of hypophysectomized female rats by combinations of an hypophyseal extract (synergist) with pregnancy-prolan,** H. M. EVANS, R. I. PENCHARZ, and M. E. SIMPSON (*Endocrinology*, *18* (*1934*), *No. 5*, *pp. 601–606*).—The synergistic effect of a hypophyseal extract, prepared free from the growth, thyrotropic, and lactogenic hormones and possessing only traces of the gonadotropic hormone, was demonstrated at the University of California on 57 hypophysectomized and 51 normal female rats. It was found that prolan combined with the hypophyseal synergist stimulated ovarian growth in hypophysectomized females as effectively as in normal immature females.

***Maintenance* and repair of the reproductive system of hypophysectomized male rats by hypophyseal synergist, pregnancy-prolan, and combinations thereof,** H. M. EVANS, R. I. PENCHARZ, and M. E. SIMPSON (*Endocrinology*, *18* (*1934*), *No. 5*, *pp. 607–618*, *figs. 8*).—Studies similar to the above were conducted on 53 hypophysectomized male rats. The testes of hypophysectomized males were caused to grow when the hypophyseal synergist, pregnancy prolan, or a combination of the two was administered. More complete repair or development of the testicle, equal to normal, was effected by administration of the combination of the two hormones.

The hypophyseal growth hormone and glutathione concentration; does the hormone influence the concentration concurrently with the stimulation of increase in weight? P. W. GREGORY and H. GOSS (*Jour. Expt. Zool.*, *69* (*1934*), *No. 1*, *pp. 13–35*, *figs. 5*).—In testing the relationship between increase in weight induced by the hypophyseal growth hormone and the glutathione content of the tissues, two experiments were conducted at the California Experiment Station. Twenty-eight female rats, 5 mo. of age, were selected. Of these, 14 were injected daily with 1 cc of hypophyseal growth hormone and the others were untreated. After 15 days the controls had gained an average of 2.4 g per rat, whereas the injected group gained an average of 47.3 g per rat.

The weights of the muscle from the hind legs and loin and the liver of the treated animals were heavier than in the untreated group, and greater amounts of the iodine-reducing substance were present in the muscle and liver of treated animals than in the controls.

A second series of experiments was similarly conducted with 30 females except that the controls were injected with hypophyseal extract rendered nonpotent by heat. The results were similar to those obtained in the first experiment except that the liver and muscle were analyzed for ascorbic acid and glutathione as well as the iodine-reducing substance.

The effect of castration on the anterior hypophysis of the female rat, E. T. ELLISON and J. M. WOLFE (*Endocrinology*, *18* (*1934*), *No. 5*, *pp. 555–575*, *pls. 2*, *figs. 2*).—A report is given of the histological changes observed in the hypophysis at intervals ranging from 5 to 500 days after castration of 100 adult virgin female rats as compared with the hypophysis of 40 normal females. The more pronounced changes were noted after 30 days, from which time the percentage of castration cells increased rapidly.

Hormones of the hypophysis of the infantile rat, O. SWEZY (*Endocrinology*, *18* (*1934*), *No. 5*, *pp. 619–624*).—Studies of the effect of hypophyseal im-

plants from donors from 1 to 21 days of age to adult hypophysectomized hosts showed that the glands from rats from 1 to 13 days of age produced no effect on the external genitals or the weight of the seminal vesicles. Pronounced effects were noted from three successive implants when the donors were older.

The response of guinea pig mammary glands to injected sex hormones and ovarian grafts and its bearing on the problem of sex hormone antagonism, G. K. Smelser (*Physiol. Zool.*, *6* (*1933*), *No. 3*, *pp. 396–449*, *figs. 12*).—Results are presented dealing with the influence of estrin, the testis hormone, and ovarian grafts on the development of the mammary gland and interactions with the hypophysis of normal and castrated male and female guinea pigs.

Length of oestrous cycle and duration of pregnancy in ewes, D. A. Gill (*New Zeal. Jour. Agr.*, *47* (*1933*), *No. 5*, *pp. 305–307*).—The average duration of pregnancy among 52 Romney ewes was 148.75 days, and the normal interval between periods of estrum was judged to be from 15 to 18 days. Date of service was determined by the smearing of dye on the brisket of the rams to mark the ewes served.

Effect of absence of light on the breeding season of the ferret, M. Hill and A. S. Parkes (*Roy. Soc.* [*London*], *Proc.*, *Ser. B*, *115* (*1934*), *No. B 791*, *pp. 14–17*, *pl. 1*).—In a study of the influence of the absence of light on the occurrence of the normal breeding season, 5 male and 5 female ferrets were kept in complete darkness from January 24 throughout the spring except for a short time each day for feeding and caring for the animals. The results showed that the onset of the breeding season was not affected. The observations were verified by histological studies of the testicles, ovaries, and uteri of the animals.

The effect of gonadectomy on the secondary sexual characters of the Bronze turkey (M. gallopavo), H. M. Scott and L. F. Payne (*Jour. Expt. Zool.*, *69* (*1934*), *No. 1*, *pp. 123–136*, *pls. 4*).—The plumage character of castrated male and female turkeys was compared with normal birds of the two sexes in studies at the Kansas Experiment Station. The birds were 9 weeks of age at operation. Sixteen weeks later the gonadectomized males and females resembled the male in plumage pattern. One incompletely ovariectomized female developed the male type of plumage on her breast, presumably as the result of her operation, and later, as the piece of ovary developed, the balance of the plumage was of the female type. Ovariectomized turkey hens developed head furnishings of marked male type. Up to 38 weeks of age, gonadectomy showed no influence on the spur development characteristic of the sex.

Females as well as castrated males were observed to strut similar to normal males, but the vibrating sound was not emitted except by normal males. Capons seldom "gobble."

FIELD CROPS

[**Agronomic research in Alabama, 1933**], R. Y. Bailey, E. L. Mayton, H. B. Tisdale, D. G. Sturkie, G. L. Fick, E. V. Smith, L. M. Ware, and J. F. Duggar (*Alabama Sta. Rpt. 1933*, *pp. 9–15*, *24–26*, *30*, *31*, *32*).—Research (E. S. R., 71, p. 615) for which progress results are reported included top-dressing experiments with potassium chloride on cotton; histological studies of the fiber and seed of cotton; vetch turned under at different dates for corn and cotton compared with parallel treatments of sodium nitrate; comparison of manure, sodium nitrate, and vetch as nitrogen sources for cotton and corn in a 2-yr. rotation; tests of selections of oats and Austrian winter peas for

yield and cold resistance; effect of fertilizers on nodule numbers, and of inoculation on nodule numbers and yields in Spanish peanuts; differences in root nodule formation on Spanish and Runner peanuts; influence of fertilizer treatment on certain characteristics of potatoes; a study of winter lawngrasses and their effect on Bermuda grass; control of weeds in lawns with calcium cyanamide; studies of nutgrass, including effects of clipping, sprouting tests with tubers, development of root system, and control by cultivation; and control of wild onion, including a study of bulb development.

[**Field crops experiments in Alaska, 1933**] (*Alaska Col. Sta. Bul. 3 (1933), pp. 4, 10–24, 29–33, figs. 6*).—Reports of progress are given from agronomic studies (E. S. R., 70, p. 321) carried on at the station and at the Matanuska Substation (B. B. Burroughs), including variety trials with potatoes, sweetclover, peas and other forage legumes, and pasture grasses; variety-fertilizer tests with alfalfa and various clovers; fertilizer tests with bromegrass, pasture grasses, and wheat; breeding work with wheat; germination studies with wheat, oats, and barley, harvested at different stages of maturity; crop rotations; and production operations and costs involved in growing vetch, field peas, oats, oats and vetch, and potatoes, in a rotation scheme.

[**Field crops work in Hawaii**] (*Hawaii Sta. Rpt. 1934, pp. 7–11, 13, 14, figs. 2*).—Progress results are reported from experiments including breeding work and study of natural crossing with pigeonpeas; variety tests with soybeans for green vegetable use, potatoes, and sweetpotatoes; adaptation studies with numerous forage grasses and legumes; studies of the flowering and seeding habits of Napier and Merker grasses (E. S. R., 72, p. 469); effect of location, species, and season on quality (composition) of pasture grasses; response of pasture to fertilizers and cultivation; fertilizer tests with rice and potatoes; and the production of disease-free seedstocks of Triumph potatoes.

[**Field crops research in Kansas, 1932–34**] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 33–35, 36–49, 51–55, 124–127, 129–131, 132, 133, 134*).—Continued agronomic experiments (E. S. R., 69, p. 199) again reported on briefly from the station and substations included variety tests with winter wheat, corn, oats, barley, grain sorghum, sorgo, flax, potatoes, soybeans, alfalfa for yield, winter hardiness, and wilt resistance, sweetclover, vetch, crotalaria, and miscellaneous grasses and legumes and forage mixtures; breeding work with corn for yield and insect resistance, popcorn, wheat, oats, barley, grain sorghum, sorgo, soybeans, alfalfa, and sweetclover; inheritance studies of factors affecting quality in wheat, including protein determinations and milling and baking tests on nursery-grown varieties and hybrids, cooperative baking tests of Quivira and Tenmarq wheat, and wheat meal time-fermentation tests in cooperation with P. Pelshenke; cultural (including planting) experiments with corn, wheat, grain sorghum, flax, soybeans, potatoes, alfalfa, Sudan grass, and buffalo grass; comparison of seedbed preparations for wheat, flax, Sudan grass, and sweetclover; effects of burning stubble on wheat yields; fertilizer tests with corn, wheat, oats, alfalfa, sweetclover, and potatoes, and liming trials with sweetclover; fertilized, irrigated, and ordinary crop rotations; cold resistance studies with wheat, rye, oats, and barley; study of sorgo varieties for differences in moisture, juiciness, and sugar content; an experiment on the relative photosynthetic efficiency of upper and lower corn leaves; a physiological study of the hard winter wheat plant; wheat investigations including studies of milling and baking quality as affected by variety and seedbed preparation, chemical and tempering factors affecting quality of wheat flour, and effects of time-of-seeding, nitrogen fertilizers, and previous alfalfa on protein content of wheat; pasture improvement work including management of livestock and

effect of burning on bluestem pastures, eradication of undesirable plants, effects of various clippings (simulating grazing), and of fertilizers on yield, vigor, and quality of pastures, and effects of moderate and heavy grazing of buffalo and little bluestem grasses on percentage run-off, and soil erosion; seed production studies with bluestem grasses and their growth under irrigation; the merits of crested and slender wheat grasses for reseeding cultivated dry lands to permanent grass; the leaf production of lespedeza species in rows and broadcasted; control of bindweed and Russian knapweed by sodium chlorate sprays supplemented by various cultural practices; and comparison of sodium chlorate with other chemicals for bindweed. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

Crop mixture trials in Michigan, R. H. MORRISH (*Michigan Sta. Spec. Bul. 256 (1934), pp. 11, figs. 2*).—Production trials (E. S. R., 67, p. 31) of varieties of oats, barley, field peas, and wheat, grown alone and in different combinations, 1929–33, showed oats and barley to constitute the most desirable mixture in yield and total digestible nutrients per acre. No other mixture tested equaled oats or barley alone or an oats-barley mixture. Inclusion of field peas in mixtures invariably reduced total yields and increased threshing difficulties, and too few peas were produced in the mixture to improve the protein content. Oats and barley, as represented by the better varieties, were practically equal in production of pounds of feed per acre. The best seedings of sweetclover were obtained in field peas and in the early-maturing, stiff-strawed varieties, Spartan barley and Iogold oats.

Comparative values of farm crops grown at the central and branch stations in yield trials, H. K. HAYES and C. BORGESON (*Minnesota Sta. Bul. 312 (1934), pp. 16, fig. 1*).—Yields in varietal trials from 1921 to 1932, inclusive, at the central and 5 branch stations were used to compare the relative values of the several crops for feed on the farm, cash values on the basis of yields, and average prices over a 10-yr. period. Recent feeding trials at the station with application to using home-grown grain on the farm in feeding dairy and beef cattle and hogs are reviewed briefly.

Average yields of oats ranged from 53.7 to 72.6 bu. per acre; of barley 28.8 to 52.1; of corn 32.6 to 56.4; hard red spring wheat 16.6 to 25.7, durum 16.1 to 29.2, and winter wheat 10.1 to 30; rye 17.2 to 34.2; flax 8.5 to 16; soybeans 9.8 to 18.3; field beans 16.1 to 22.1; and field peas 18.1 to 20.7 bu. The three legumes were grown at fewer stations than the cereals.

Oats gave the largest return of digestible nutrients of any of the small grains at Crookston, Morris, and Duluth, with calculated yields of 1,387, 1,331, and 1,318 lb. per acre, respectively; barley led at the station and Waseca, with 1,544 and 1,986 lb., respectively; while rye led at Grand Rapids, with 1,286 lb. Barley was second at Morris and Duluth, and oats was second at Waseca, the station, and Grand Rapids. Compared as to total yield of digestible nutrients with its nearest competitor at stations where corn was grown regularly, corn exceeded oats at Crookston and Morris by 177 and 790 lb., respectively, and it exceeded barley by 748 and 365 lb., respectively, at Waseca and the station.

Among small grains and flax, on the basis of computed cash values per acre, flax and durum wheat led in the Red River Valley. Flax also led at Waseca and Duluth, hard red spring wheat at the station, and winter wheat at Grand Rapids. Winter wheat was second at the station and Waseca; hard red spring wheat, second at Crookston and Duluth; durum wheat, second at Morris; and rye, second at Grand Rapids.

[Field crops experiments in Oklahoma, 1932–34], H. F. MURPHY, H. J. HARPER, H. A. DANIEL, L. L. LIGON, H. W. STATEN, C. B. CROSS, J. C. IRELAND, B. F. KILTZ, J. E. WEBSTER, R. A. MCGINTY, and E. F. BURK (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 22–27, 33–66, 187, 188, 231–234, 250, 251–253, 254, figs. 5*).—Research with field crops (E. S. R., 68, p. 609), reviewed for the above period, included variety tests with cotton, corn, popcorn, wheat, oats, grain sorghum, sorgo, alfalfa, cowpeas, soybeans, mung beans, vetch, and winter peas, miscellaneous grasses, clovers, and sweetpotatoes; breeding work with cotton, corn, wheat, grain sorghum, and alfalfa; comparison of corn breeding methods; cultural (including planting) experiments with cotton, oats, barley, grain sorghum, sorgo, sweetclover, cowpeas, soybeans, mung beans, Bermuda grass, and winter peas and vetch; fertilizer trials with alfalfa, sweetclover, crops in rotation, potatoes, and sweetpotatoes; cowpeas as green manure; a fertilizer wheat rotation; influence of fertilizer on yield, composition, and baking quality of wheat; effect of seed and soil treatments on yields of fall-crop potatoes; analyses of soybeans for iodine number and oil and protein content; effect of climatic conditions on composition of alfalfa and prairie hay; adaptation studies with pasture grasses and legumes; clipping native grasses to simulate grazing; and study of factors affecting quality in cotton, including blooming, maturity, and shedding, and how seasonal conditions affect fruit formation, effect of Texas root rot and cotton wilt on length, strength, and uniformity of fiber, and effect of moisture on breaking strength of fiber.

[Field crops research in Oregon] (*Oregon Sta. Bul. 334 (1934), pp. 28, 29, 46, 52, 53, 58, 59, 62, 63, figs. 2*).—Outstanding accomplishments and progress results are reported from agronomic work at the station and substations, often in cooperation with the U. S. Department of Agriculture, including breeding work with wheat and barley; variety tests with wheat, corn, barley, flax, turnips, and miscellaneous grasses and legumes; crop rotations; seedbed preparations for cereals; control of soil erosion; pasture irrigation; seed production of vetches, winter field peas, clovers, and grasses; and wheat experiments dealing with response to fertilizers, crop residues, methods and depth of plowing for fallow, and furrow drill v. ordinary drill. Meritorious varieties or strains of wheat, barley, oats, corn, alfalfa, clover, winter field peas, vetch, grasses, flax, potatoes, and turnips, developed or introduced by the station, are noted.

[Experiments with field crops in Washington], O. E. BARBEE, O. A. VOGEL, E. G. SCHAFER, E. F. GAINES, V. B. HAWK, A. M. SCHLEHUBER, A. L. HAFENRICHTER, C. L. VINCENT, H. M. WANSER, H. P. SINGLETON, and D. J. CROWLEY (*Washington Sta. Bul. 305 (1934), pp. 13–16, 18–21, 46, 47, 53, 54, 55, 56–58, 63*).—Continued research with field crops (E. S. R., 71, p. 181), reported on from the station and substations and in some lines in cooperation with the U. S. Department of Agriculture, included variety tests with spring and winter wheat, barley, oats, corn, seed flax, alfalfa, sweetclover, soybeans, field peas, and chickpeas; trials of forage grasses, especially new and improved strains; breeding work with wheat, oats, barley, rye, corn, sunflowers, potatoes, field peas, and sweetclover; inheritance studies with corn and wheat; cutting tests with sweetclover; seed production studies with crested and slender wheatgrass; methods of planting grasses; storage tests with washed potatoes; fertilizer tests with alfalfa and with potatoes, corn, and wheat in rotation; crop rotation; study of competition between alfalfa and sweetclover and cereals and grasses as companion crops; and control of bindweed and weeds in cranberry bogs with chemicals.

Forking as an aid to turf recovery after drought, R. B. Dawson (*Jour. Bd. Greenkeeping Res. [England], 3 (1934), No. 11, pp. 235–241, pls. 3*).—Perforation of matted turf was shown to be an efficient means of aiding turf recovery by allowing water to penetrate. Forking also aids drought resistance, is a necessary counterpart to artificial watering, is helpful in relieving consolidation, facilitating surface drainage and providing a means of introducing top-dressing material to improve the soil, and improves root development. Solid tine forking is more rapid than tubular tine and gave experimentally as good results at St. Ives Research Station in aiding water penetration with less disturbance of the playing surface. Tubular forking is better where much top-dressing must be introduced to improve the soil in the worst cases, but when used this must be sufficient to fill the holes.

Effect of burning on Kansas bluestem pastures, A. E. Aldous (*Kansas Sta. Tech. Bul. 38 (1934), pp. 65, figs. 12*).—Burning experiments conducted 1927–33, on the college and Casement areas of bluestem pasture near Manhattan (mean annual precipitation 31.49 in.), comprised plats burned annually in late fall, early spring, medium spring, and late spring, and unburned plats. The college area also included a series burned in alternate years. On both areas, big bluestem (*Andropogon furcatus*) and little bluestem (*A. scoparius*) were the dominant grasses, and other important grasses were Indian grass, side-oats grama, prairie junegrass, prairie dropseed, Kentucky bluegrass, and switchgrass.

Burning decreased yields of the mature vegetation, the plats yielding in the increasing order of late fall burned, early spring, medium spring, and late spring burned. Bluestem grasses on burned plats were more leafy during the early part of the growing season than on unburned plats. The nutritive content of the forage depended upon the amount of growth. In early June the protein content was highest for vegetation on plats burned in the late spring, and was followed in order by forage on the unburned, on medium spring burned, and on the fall and early spring burned plats.

The plant population was greatest on late fall burned plats and least on those burned in the late spring. Plats burned in the late fall and early spring had more plants than the unburned plat. The late fall burned plats had a successional change toward the little bluestem, while in the late spring burned plats the change was toward the coarser grasses, mainly big bluestem. Kentucky bluegrass increased on all unburned plats and was either decreased or eliminated on all burned plats.

Burning had little effect in controlling weeds and brush unless done in late spring or after April 20. The effectiveness of burning largely depends upon the time the plants start growth in the spring and the movement of their food reserves. If the low point in the organic food reserves is later than May, as in sumac, burning is not effective in eradication.

The moisture content of the soil was higher on the unburned than on the burned plats, and was affected somewhat by the time of burning. During 1933, an extremely dry season, the soil moisture content was greatest in late spring burned plats, followed by medium spring burned and lowest in plats burned in fall and early spring.

Burning stimulated early growth in the spring, due mainly to the higher soil temperatures. Plats burned in early spring and late fall contained a greater vegetative growth until early in June, when moisture rather than temperature was the controlling factor in growth. Burning did not cause any decrease in the organic matter or total nitrogen of the soil during a 5-yr. period.

The accumulation of organic matter and total nitrogen in prairie grassland seemed to be governed more by root development than by the accumulation of surface material. Differences in the effects of burning upon nitrate development in the soil were not considered significant. It is pointed out that in these experiments the burning was always done when the soil was moist; if the burning had been done when the soil was very dry, results might have been different. The effect of burning on the utilization of bluestem pastures is discussed briefly.

Effects of soil type and soil treatments on the chemical composition of alfalfa plants, A. L. Grizzard (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 81–99*).—The composition of alfalfa grown on Isabella sandy loam, Montcalm sandy loam, Mancelona gravelly sandy loam, Fox sandy loam, Brookston loam, Brookston clay loam, Brookston silt loam, Gilford loam, and Miami silt loam, and the effects of limestone and phosphorus and potassium fertilizers on the nitrogen, calcium, and phosphorus contents of alfalfa grown on these soil types were studied at the Michigan Experiment Station.

The first cuttings of alfalfa grown on the several soil types exhibited a much lower ratio of leaves to stems than the second cuttings at the one-half bloom stage. The weight of stems exceeded that of the leaves in the first cuttings, the reverse of the condition for the second cutting. In both stems and leaves the nitrogen content tended to be higher in the second than in the first cuttings harvested in the one-half bloom stage. Regardless of soil type and soil treatment, the calcium content of leaves was from 2 to 3 times greater than that of the stems.

In plants grown on Isabella sandy loam the calcium content of the stems tended to be higher in the second than in the first cuttings, but the opposite was true as to the leaves. The data on the other soil types were not complete enough for such comparison. Plants on the Isabella soil showed that all soil treatments containing limestone increased the nitrogen content of both stems and leaves, but tended to depress the phosphorus content. In general, plants grown on soils not requiring limestone showed increases in phosphorus content of both stems and leaves with fertilizer treatments containing superphosphate alone or with potash.

Alfalfa from Gilford loam was markedly higher in calcium content than plants grown on the other soil types. Plants grown on Isabella sandy loam soil showed a decidedly higher phosphorus content in both stems and leaves than those from the other soils. Plants on Montcalm sandy loam soil in the greenhouse required very heavy applications of phosphate for material increase in their phosphorus content. The phosphorus content of alfalfa grown on these soil types was not low compared to that of alfalfa from other States.

No advantage of the systematic over the random method of taking samples of alfalfa for chemical analysis was indicated.

Fifteen years of selection in six varieties of barley, M. N. Pope (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 142–148, figs. 2*).—No change in spike internode length of barley was evident in any of six varieties after 15 yr. of selection by the U. S. Department of Agriculture, cooperating with the Idaho Experiment Station, when the mean of the lax strains and the mean of the dense strains were compared. When strains most divergent for spike-internode length in the last year grown are compared, the Jet, Manchuria, and Hannchen varieties showed no significant trend. A suspected mutation in density appeared in 1922 in Hanna, but no significant trend was evident in 11 yr. of selection after that date. A density mutation appeared in 1918 in Deficiens and was effective in producing a permanent difference in internode length. A "progeny

drift (genorhep)" was recognized only in Svanhals, a barley of hybrid origin. In approximately 35,000 plants studied there occurred one mutation for internode length in Deficiens, one for irregularly spaced nodes in Hanna, and a suspected one for internode length in Hanna.

Blue color in malting barley [trans. title], O. TEDIN (*Sveriges Utsädesför. Tidskr., 44 (1934), No. 6, pp. 417–422; Eng. abs., p. 422*).—Blue color in the aleurone layer of malting barley appeared to be developed only under extreme weather conditions, being especially favored by factors causing premature ripening of grain and in those varieties having the required genetic constitution. Varietal differences and the effects of nitrogenous fertilizers are described.

A study of the physical and chemical properties of red clover roots in the cold-hardened and unhardened condition, G. A. GREATHOUSE and N. W. STUART (*Maryland Sta. Bul. 370 (1934), pp. 147–165, pl. 1, figs. 3*).—In field and laboratory tests, Ohio red clover proved slightly more cold hardy than Maryland red clover and both surpassed the nonhardy French red clover. When grown in the greenhouse and not hardened to cold, the Ohio and French varieties were similar in composition, but they differed markedly in composition in the cold-hardened condition of the field. Comparison of the cold-hardy and nonhardy red clover roots indicated that winter hardiness is associated with greater concentrations of carbohydrates and nitrogen, lower moisture content, a larger unfreezable water value, a lower specific conductance value; and a slightly higher pH value. The carbohydrate-nitrogen ratio was narrower for the French variety than it was for the Ohio variety, irrespective of the basis of expression. This ratio narrowed with the approach of spring. The carbohydrates used in metabolism, it was observed, are transported from the root more rapidly and slightly in advance of the nitrogen fractions. Roots of the Ohio clover exhibited a consistently higher percentage of unfreezable water than did those of the French variety. From January until April, the percentage of unfreezable water decreased in all of the clovers, and the organic food reserves likewise decreased.

The calorimetric method proved of value in measuring the difference between the intensity of the forces of the tissue and that of the external temperature in cold-hardy and nonhardy varieties of red clover. It is believed that the unfreezable water value will not be constant for plant tissues in all physiological states as the subzero temperature is lowered.

Why red clover fails, E. A. HOLLOWELL (*U. S. Dept. Agr. Leaflet 110 (1934), pp. II+6, figs. 3*).—Factors discussed as responsible, alone or in combination, for clover failure include unfavorable soil conditions, unadapted or poor seed, poor seeding methods, wrong grazing or cutting treatment, and diseases and insects. This information is a revision of and supersedes that given in Farmers' Bulletin 1365 (E. S. R., 51, p. 138).

Pole beans vs. soybeans as a companion crop with corn for silage, R. G. WIGGANS (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 154–158*).—The extreme differences between the behavior of pole beans and soybeans when grown in combination with corn and the very significant loss in total dry matter when Kentucky Wonder pole beans were used with corn for silage, in Cornell University experiments in 1933–34, suggested for conditions similar to those of New York State that these pole beans cannot be grown to advantage with corn for silage, but that the loss in dry-weight production of corn in a corn-soybean combination is more than made up by the dry-weight production of the soybeans.

Illinois corn performance tests.—Results for 1934, G. H. DUNGAN, J. R. HOLBERT, W. J. MUMM, J. H. BIGGER, and A. L. LANG (*Illinois Sta. Bul. 411*

(1935), pp. 53–88, figs. 5).—As a part of a coordinated corn-improvement program conducted in cooperation with the U. S. Department of Agriculture and the Illinois Natural History Survey, 45 open-pollinated varieties and 132 hybrids were tested in 1934 for yield and quality at 12 different places in Illinois, representative of the principal corn-growing districts. The entries were appraised on lodging resistance, general grain quality, total yield, and sound yield.

The detailed performance of all entries on the 13 different fields is set forth in tables. The best commercial hybrids proved far superior to the leading open-pollinated varieties, and the better experimental hybrids were distinctly better than the best commercial hybrids. On the 10 fields where comparisons were possible, the 5 open-pollinated varieties had an average performance rating of 71.7, the 5 best commercial hybrids 86, and the 5 best experimental hybrids 96.5. The average yield of sound corn from all open-pollinated varieties was 33.4 bu. per acre, from the commercial hybrids 39, and from the experimental hybrids 46.3 bu. The hybrids having high performance records showed as much adaptational range from north to south and east to west as did the best open-pollinated varieties. Many hybrids showed great capacity to endure the drought and heat of the 1934 season. In ability to utilize plant-food materials in the soils, some entries showed a much higher degree of efficiency than others.

Corn varieties for North Carolina, 1925–34, P. H. Kime *(North Carolina Sta. Agron. Inform. Circ. 91 (1935), pp. [2]+5).*—Varieties of corn recommended for different locations in North Carolina from results of extensive variety tests included Latham Double, Biggs Two Ear, Highland Horsetooth, Weekley Improved, Cocke Prolific, Southern Beauty, Holcombe Prolific, Jarvis Golden Prolific, and Indian Chief.

The what and how of hybrid corn, F. D. Richey *(U. S. Dept. Agr., Farmers' Bul. 1744 (1935), pp. II+14, figs. 5).*—Practical information is given on reproduction in corn, the selection of inbred strains and finding good hybrid combinations, production of hybrid seed corn, the yields of hybrids v. open-pollinated corn, the merits and adaptations of different hybrid corns, and sources of hybrid seed.

Physiologic factors affecting the germination of seed corn, J. L. Robinson *(Iowa Sta. Res. Bul. 176 (1934), pp. 65–112, figs. 8).*—Physical and physiological differences existing between kernels of open-pollinated field corn harvested at the dough, glaze, full dent, and mature stages of development were studied in Golden King from the 1929 crop and Iodent of 1930 and 1931 crops.

The kernel was not completely developed when harvested as early as the soft-dough stage, when it contained 60 percent of water. The kernel weight, volume, bushel test weight, specific gravity, and crushing resistance tended to increase as the kernels became more mature. The rates of development of the germ and endosperm portions of the kernel after it had reached the dough stage did not differ significantly. The percentage of nitrogen and of sugars was greater in immature than in fully developed kernels, although the actual quantity in each kernel was less.

More water was absorbed during immersion by each unit of weight of immature kernels than of those fully developed, although the actual quantity of water absorbed by each kernel of samples differing in maturity varied little. As to resistance to breakdown when immersed in water, kernels harvested in the dough stage lost viability faster than did those more completely developed at harvest. In 2 yr. little difference existed in this regard between seed harvested when glazed, when fully dented, and when mature.

A greater percentage of the weight of kernels was found in solution after dough- and glazed-stage seed were immersed than in the case of those fully

dented and matured. The quantity of sugar was greater in the solution from kernels harvested in the dough stage than from more mature kernels. After immersion for 72 hr. little difference was found in the percentage of sugar in the solute from the different samples. The most nitrogen was present in the extract from dough-stage kernels and the second greatest quantity was from glazed kernels. The fully dented and the mature kernels differed little. The greater portion of sugars present in the air-dry corn was nonreducing. After immersion in water for 72 hr. the greater portion of this, both in kernel and in solution, had been reduced to simpler sugars. In 2 yr. the diastasic activity for each unit weight and for each kernel diminished as the kernels became more fully developed.

The early harvested kernels germinated faster than those harvested later, but in 4 or 5 days were surpassed in rapidity of early growth by the more mature kernels. In greenhouse plantings seedlings from mature and fully dented kernels emerged from the soil more quickly than those from kernels harvested in the dough stage, while glazed-stage kernels were intermediate. Field-grown plants from dough-stage seed were shorter than those from the more mature stages for the first 51 days, and grew more slowly than those from the more fully developed seed until a height of 45 to 50 cm was reached, after which the rate became equal. Seeds harvested at different stages of maturity were equally productive when equal stands were obtained in the field. Immature kernels did not give as good a stand as mature kernels, and consequently yielded less when planted at uniform rates. Samples dried slowly but so as not to mold differed little in performance from those dried rapidly. Kernels harvested for seed from a plat receiving superphosphate did not differ from those from an untreated plat.

The toxic influence of fluorine in phosphatic fertilizers on the germination of corn, H. H. Morse (*Soil Sci., 39 (1935), No. 3, pp. 177–195, pl. 1, fig. 1*).—Laboratory, greenhouse, and field experiments at the Michigan Experiment Station showed that superphosphates investigated could exert a toxic influence on the germination of corn as a result of their content of soluble fluorine. The soils used were effective in reducing or overcoming the toxicity provided sufficient reaction took place between the soil and the fertilizer. These two facts seem to explain the high toxicity of superphosphates placed in direct contact with the seed and also the reduction of this toxicity when the superphosphates were mixed with soil. Corn was found to be very variable in its susceptibility to fluorine injury. Facing the embryo of the seed toward the superphosphate resulted in greater reduction in germination than when the position of the kernel was reversed, provided the fertilizer diffused away from the seed. There was considerable difference in the amount of injury produced by the three superphosphates investigated.

Grades of fertilizers for corn and cotton (*Alabama Sta. Circ. 70 (1935), pp. 12*).—Field tests in 8 localities in Alabama, made during 5 yr. to determine the best grade of fertilizer for corn and cotton when grown on the same land in alternate years, indicated that for corn on average soils already well-fertilized with phosphorus and potassium for other crops, 36 lb. of nitrogen per acre (225 lb. of sodium nitrate or equivalent) may be the only fertilizer needed. Under certain conditions, phosphate may also be applied profitably. The fertilizer mixture suggested as best for cotton furnishes nitrogen 36 lb., phosphoric acid 48 lb., and potash 24 lb. per acre. These amounts of nutrients may be supplied by 600 lb. of a 6–8–4 fertilizer, or by 600 lb. of a 4–8–4 fertilizer and a side application of 75 lb. of sodium nitrate or its equivalent.

Results of cotton variety experiments, 1930–1934, P. H. KIME (*North Carolina Sta. Agron. Inform. Circ. 92 (1935), pp. [2]+4*).—Results of continued variety trials with cotton (E. S. R., 69, p. 203) led the station to recommend certain strains of Mexican and Cleveland for the Piedmont, of Cleveland, Mexican, and Farm Relief for the Upper Coastal Plain, of Foster and Farm Relief for heavy and poorly drained soils in the lower Coastal Plain, and of Dixie-Triumph, Clevewilt, and Dixie for wilt-infested soils. Surveys in cooperation with the U. S. Department of Agriculture showed the percentage of 15/16 in. and longer cotton grown in North Carolina in 1934 to 73.4 v. 20.3 in 1928, indicating marked improvement in staple length. The better varieties stapling 1 to 1 1/16 in. have produced as high or higher yields than those cottons with 7/8 in. or shorter staple with greater cash returns, due to premiums for the longer staple.

The nomenclature of the cowpea group of root-nodule bacteria, R. H. WALKER and P. E. BROWN (*Soil Sci., 39 (1935), No. 3, pp. 221–225*).—Since certain strains of soybean bacteria were found at the Iowa Experiment Station to be capable of producing nodules on cowpea roots and certain strains of cowpea bacteria were found capable by others of producing nodules on soybean roots, it is suggested that the root-nodule bacteria of these plants be embraced in the species designated *Rhizobium japonicum*. "Different strains of this species of *Rhizobium* exhibiting difference in their abilities to produce nodules on certain plants within the cross-inoculation group may well be considered as biological variations within the species."

Lespedeza sericea, C. A. MOOERS and H. P. OGDEN (*Tennessee Sta. Bul. 154 (1935), pp. 19, figs. 5*).—The growth characteristics of *L. sericea*, the seed and its germination, varieties, adaptation, its value for hay and pasture and for erosion control, cultural methods, and harvesting the hay and seed crops are discussed from experiments at the station and substations. Proximate analyses of the leaves, stems, and whole plant from different cuttings are included, and the experiences of farmers with the crop are appended.

While both of the principal strains are similar and well adapted to the soils and climate of Tennessee, No. 04730 appeared more aggressive and earlier, and better in seed yield than No. 12087. Cultural recommendations include sowing 15 lb. per acre of scarified seed from February to late July, although best results were had from March or early summer plantings by avoiding or harrowing out weeds, or 25 lb. of unscarified seed in January or February, and planting on a firm seedbed and barely covering or not at all in freezing weather. Seeding with nurse crop has given good results, while seedings on established meadows or pastures have failed. The yields of hay per acre decreased as the number of cuttings increased from 2 to 4 per season. The seed crop may be harvested when 85 to 90 percent of the hulls are brown. The hay yield surpassed that of annual lespedezas, but might be inferior to alfalfa when conditions favor the latter. The hay resembles annual lespedeza in chemical composition, although less palatable to some animals and apparently inferior to alfalfa hay in quality. Limited experiences of farmers were favorable and indicated that the crop is worthy of extensive trial throughout Tennessee, especially on the more hilly land deficient in lime and phosphate where it seemed likely to surpass all other legumes in reducing erosion and providing hay and pasturage.

The effects of inoculation and fertilization of Spanish peanuts on root nodule numbers, J. F. DUGGAR (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 128–133*).—Spanish peanut plants grown at the Alabama Experiment Station and also on certain sandy soils elsewhere outside of the commercial peanut

belt were found to develop naturally only a scant supply of root nodules. Artificial inoculation of unhulled seed resulted in large increases in the numbers of both total and large nodules and in substantial average increases in yield of nuts per plant. Artificial inoculation increased nodule numbers and yields in the presence of nearly all common fertilizers tested when they did not contact the unhulled seed. However, most common fertilizers when applied in maximum contact with unhulled seed in a dry summer reduced the number of total and large nodules and yields of nuts. Correlation data for 2 yr. indicated that yields of dry nuts per plant tended to increase as numbers of either total or large nodules increased, both as determined at harvest and somewhat earlier.

Peanut growing in the Gulf Coast Prairie of Texas, R. H. Stansel (*Texas Sta. Bul. 503 (1935), pp. 16, fig. 1*).—Variety and spacing tests with peanuts at the Angleton Substation, 1915–33, are reviewed, with data on seasonal rainfall and temperature and on percentages of nuts in the forage, varietal descriptions and remarks on composition and uses of peanuts. Macspan (E. S. R., 59, p. 435) averaging 1,290 lb. of nuts per acre during the period 1927–33, Spanish 1,268 lb. of nuts, and Carolina Runner averaging 3.19 tons of air-dry forage (vines and nuts) were deemed the better varieties for the section when yields of both nuts and forage were considered. In spacing experiments with Spanish peanuts the best yields of both nuts and forage were obtained from close to medium spacing, 6 to 12 in. apart in 3-ft. rows.

Peanuts in the Philippines, J. M. Ejercito (*Philippine Jour. Agr., 5 (1934), No. 2, pp. 47–69, pls. 4, figs. 2*).—Cultural methods, field practices, and varieties considered best for peanut production in the Philippine Islands are described, with remarks on uses, marketing, production costs, and pests and diseases, and data on production, distribution, and commercial movement of the crop.

Genealogical tables of the potatoes of the world and their fertile varieties [trans. title], H. v. Rathlef (*Kühn Arch., 33 (1932), pp. 297–431*).—Potato varieties and their descendants indicated are listed in genealogical tables arranged in groups according to parentage, based on published data and information obtained directly from breeders. Descriptive lists, including reaction to wart disease, are included for the varieties producing fertile flowers, together with a varietal index and a bibliography comprising 251 titles.

Influence of different fertilizer treatments on certain characteristics of the Irish potato, L. M. Ware and W. D. Kimbrough (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 485–490*).—Alabama Experiment Station experiments dealt with the effect on the potato tuber of sources of nutrients, omission of essential elements, and different rates of complete fertilizer. Yields from sodium nitrate treatments surpassed those from ammonium sulfate and cottonseed meal in order, while storage losses were somewhat smaller with tubers receiving cottonseed meal. Potatoes receiving either potassium sulfate or chloride did not differ consistently in yield or other characteristics. Where combinations of two elements were used, the greatest response was attributable to nitrogen, with phosphorus second and potassium third. Omission of nitrogen from complete fertilizer resulted in a very large reduction in yield and in potatoes having a high loss in storage. The most consistent relationship was found to exist between potatoes receiving different rates of a complete fertilizer. With the higher rates came the larger yield, the better storage quality, the lower respiration rate, and the lower percentages of total solids, starches, and sugars until the double rates were reached. Above this rate the trends were halted or reversed. Potatoes supplied a fertilizer adequate for good production kept well and varied very little in composition regardless of the source of each material.

Factors affecting potato seed piece decay, C. L. Vincent and W. W. Pawson (*Amer. Soc. Hort. Sci. Proc., 30 (1933), pp. 491–495*).—At soil temperatures of 50° to 60° F. in Washington Experiment Station studies, there occurred less decay of potato sets and conditions favored better germination and stands than at 70°. Firm freshly cut tubers gave a higher germination percentage at 70° and above than did shriveled sprouted tubers, but decay from sets of the latter in warm soils was minimized by proper suberization. Decay was favored by prolonged excess of soil moisture and the use of siccatives (lime, sulfur, or gypsum) on cut seed planted after the soil was 70° or warmer.

Rye for pasture and seed in Tennessee, L. R. Neel (*Tennessee Sta. Circ. 52 (1935), pp. 4*).—Comparisons at the Middle Tennessee Substation at Columbia showed Balbo rye (E. S. R., 70, p. 42) to surpass other ryes tested for pasture and grain production. It furnished an average of 169 pasture days for 1 steer per acre v. 167 from ordinary commercial rye, gains made by steers being in proportion, and it averaged 21.5 bu. per acre compared with 16 for Abruzzi. At least 2 bu. per acre alone and 1.5 with crimson clover should be sown, preferably after September 15. Other cultural practices and the place of rye in the cropping system are described briefly.

[Sugarcane research in Cuba] (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 7 (1933), pp. 11–82, 170–172, figs. 6*).—The following papers of interest to agronomists were presented at the seventh annual (E. S. R., 71, p. 40) conference of the Association of Cuban Sugar Technologists and are reported in English: A Continuation of the Comparative Variety Tests on Truffin Clay at Central Baraguá, by H. G. Sorensen (pp. 11–17); It Is Time for Cuba to Know Her Soils, by H. H. Bennett (pp. 18–23); Fertilizer Experiments at Central España by the Schreiner Method, by O. Barreto (pp. 24–31); Errors in Field Experimentation with Ratoon Cane, by A. Bonazzi (pp. 32–40); The Comparative Value of Commercial Fertilizers, by A. M. Trémols (pp. 41–45); Molasses as a Fertilizer, by C. J. Bourbakis (pp. 46–50); Studies on the Solubilization of Phosphorus in Organic Fertilizers, by J. Alvariño and A. Bonazzi (pp. 51–55); Process of Decomposition of Cane Trash, by E. Babé and A. Bonazzi (pp. 56–59); Observations on Certain Diatraea Parasites of Brazil and British Guiana, by L. C. Scaramuzza (pp. 60–64); Studies in Sugar Cane Physiology, III, Oxidases, by A. Bonazzi (pp. 65–74); Studies in Sugar Cane Physiology, IV, Phosphorus in Cane, by F. Lazo and A. Bonazzi (pp. 75–82); and Tests of Sugar Bags Made of Cuban Fibres, by C. Landmann (pp. 170–172).

A pot experiment with cane grown in the same soil but under different climatic conditions, U. K. Das (*Hawaii. Planters' Rec., 39 (1935), No. 1, pp. 26–29, fig. 1*).—When grown in two localities on the same (Makiki) soil in preliminary tests, P. O. J. 36 and P. O. J. 2878 appeared to respond to the climatic factors in the same manner and extent. Makiki climate was far better than Manoa climate in the matter of yield and quality. P. O. J. 36 appeared to be better adapted to Manoa in the matter of quality than P. O. J. 2878.

Applications of the hand refractometer in sugar cane research (*Hawaii. Planters' Rec., 39 (1935), No. 1, pp. 13–25, figs. 5*).—The hand refractometer with juice punch comprise a kit suitable for measuring quickly and relatively accurately the sucrose content in growing sugarcane. C. G. Lennox illustrates its accuracy in fundamental sampling studies, including the stalk-to-stalk error in a population of sugarcane stalks and correlations between Brix and percentage of recoverable sucrose, and between Brix of the lower middle and upper portions of the stalk with percentage recoverable sucrose from the whole stalk. Its use in basic studies is also indicated by U. K. Das. Practical uses for the kit suggested by Lennox include comparative studies on seedlings,

preharvest juice sampling to determine relative maturity of fields, and determining the proper height for topping cane in the harvest field. The use of the kit in Taiwan (Formosa) is described by Y. Kutsunai.

Present Philippine standard varieties of tobacco, D. B. PAGUIRIGAN (*Philippine Jour. Agr., 5 (1934), No. 2, pp. 71–85, figs. 4*).—Tobacco varieties described as standard and grouped in a determinative key include White Burley, Romero, Samson Bafra, Pampano, Espada, Marogui, Repollo, Vizcaya, Ilagan Sumatra, Philippine Baker Sumatra, Bx (a Sumatra cross), Warne, Big Warne, Adcock, and North Carolina Bright Yellow. Introductions and tests of foreign varieties are listed.

Vetches and related crops for forage, L. G. GOAR (*California Sta. Circ. 336 (1934), pp. 18, figs. 8*).—Recommendations on seedbed preparation, time, methods, and rates of planting, and harvesting practices for vetches and related crops are based on extensive tests in many localities, largely cooperative, to supply needs for forage crops in areas unsuited to alfalfa culture. While no one variety is adapted to all conditions, the common, purple, and hairy vetches, and Austrian winter peas meet the requirements in most sections of California. Tables show the acre yields of hay produced by vetch-oats and peas-oats mixtures, the composition of the several vetches and winter peas with oats grown in mixture and of the legumes and cereals grown separately, and the average size of seed of important varieties of vetches and peas and pounds needed to plant one acre. Varieties are described.

"Bleached" wheat: Effect of heavy rain on unharvested, mature grain, W. R. JEWELL and W. B. MILLER (*Jour. Dept. Agr. Victoria, 33 (1935), No. 1, pp. 1–4*).—Results of physical and chemical studies and milling and baking tests on bleached and unbleached samples of several wheat varieties from different districts in Victoria indicated that, aside from lowered bushel weight and bleached appearance, exposure of ripe grain in the spike to heavy rain followed by drying before harvest had no appreciable deleterious effect on flour yield, baking quality, or other characteristics. Further indications were that rain does not leach out soluble constituents, with a consequent reduction in grain weight, and that therefore there is no appreciable lowering of yield from this cause.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 205 (1934), pp. 91, fig. 1*).—The percentages of germination, purity, and weed seed content, and for legumes hard seed content, are tabulated from tests of 1,139 official samples of seed collected from dealers in Indiana during the year ended June 30, 1934.

Results of seed tests for 1934, B. G. SANBORN and L. J. HIGGINS (*New Hampshire Sta. Bul. 282 (1934), pp. 22*).—Tables show the percentages of purity and germination for 412 official samples of field crops seed collected from dealers in New Hampshire during the year ended June 30, 1934.

Field bindweed and methods of control, J. W. ZAHNLEY and W. F. PICKETT (*Kansas Sta. Bul. 269 (1934), pp. 26, figs. 12*).—Field bindweed (*Convolvulus arvensis*), considered the worst weed found in Kansas, is described, with comments on its growth habits, on its spread by seed and roots, and on other weeds often mistaken for field bindweed. Control measures developed from extensive experiments by the station are treated in some detail.

Small areas of bindweed may be best controlled by spraying with a solution of sodium chlorate or by salting. The solution of 1 lb. of sodium chlorate to 1 gal. of water is best applied at the rate of 200 gal. per acre in August and from 100 to 150 gal. in September, and again in October. Equipment, precautions, and costs in using sodium chlorate, and the subsequent cropping of

treated land are also discussed briefly. Salt (sodium chloride) applied at the rate of 1 lb. per square foot, or 20 to 25 tons to the acre, will usually give almost complete control with one treatment, but will destroy the productivity of the land for many years. Hogs will destroy bindweed if a sufficient number are placed on the infested area to keep down all top growth.

On large areas of land a combination of intensive summer fallow and smother crops has proved to be the most successful and practical eradication method. Field bindweed, according to results reported from Fort Hays Substation by D. A. Savage and L. C. Aicher, can be entirely destroyed by repeated and careful clean cultivation from early in the spring of one year to about July 1 of the next year, followed by a smother crop of drilled sorghum.

Toxicity of several chemicals to a species of moss common to old pastures in the New England States, A. B. BEAUMONT (*Jour. Amer. Soc. Agron., 27 (1935), No. 2, pp. 134–137*).—The toxicity of 17 chemical compounds, including several common nitrogen and potassium fertilizers and sodium salts, to haircap moss (*Polytrichum commune*) (E. S. R., 67, p. 35), a species common in New England upland pastures, was studied by field tests at the Massachusetts Experiment Station. The toxicity of the materials used was found to vary with their ionic combinations, the ions being toxic in the decreasing order for cations, Na, K, Ca, NH_4, and for anions, NO_3, Cl, SO_4, CO_3. The eradicating power of the materials used and the soil reaction induced by them were not correlated. The explanation of the effect of the different materials seemed to lie in the physiological requirements of the moss.

HORTICULTURE

[Horticulture at the Alaska Station] (*Alaska Col. Sta. Bul. 3 (1933), pp. 5–9, 33–39, figs. 8*).—Brief reports are presented on variety tests of blueberries, currants, and raspberries at the College, by G. W. Gasser, and of tree fruits, bush fruits, strawberries, and ornamentals at the Matanuska Substation, by B. B. Burroughs.

[Horticulture at the Hawaii Station] (*Hawaii Sta. Rpt. 1934, pp. 11–13, 14–24, 31, figs. 2*).—Progress reports are presented on investigations in the improvement of the native raspberries and other Rubi by selection and crossing; hybridization of sweet corn; fertilizers for cabbage; improvement of the lima bean; breeding of lettuce; propagation, culture, and marketing of Macadamia nuts; varieties, propagation, pruning, and fertilization of coffee; the composting of coffee pulp; and varieties of miscellaneous fruit plants.

[Horticultural work by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 35, 55–60*).—Brief mention is made of experiments in the fertilizing and spraying of apple trees, by R. I. Throckmorton, R. J. Barnett, L. E. Melchers, G. A. Dean, and T. R. Reitz; spraying of apple and peach trees, pruning of young sour cherry trees, grafting of apples, soil management of orchards, growth of root systems of apple as influenced by the soil and soil treatment, anatomical structure of apple leaves of different varieties, photosynthetic activity of apple trees, and testing of varieties of peaches and nectarines, all by Barnett, W. F. Pickett, and G. A. Filinger; pruning of grapes, by Pickett and Filinger; and catalase activity in treated asparagus roots, vegetable soil sterilization, tests of flowers and vegetable varieties, heating mediums for hotbeds, and the forcing of ornamentals, all by W. B. Balch.

[Horticulture at the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 188–190, 234–249, 250, 251, 254, 255, figs. 5*).—Included are reports of investigations dealing with the effects of fertilizer treatments on the chemi-

cal composition of strawberries and tomatoes, the composition of different varieties of grapes, and chemical changes in ripening Concord grapes, all by J. E. Webster; comparative hardiness and productivity of different varieties of pecans, the effect of zinc sulfate on pecan rosette, varieties of walnuts, apples, peaches, nectarines, plums, cherries, quinces, persimmons, figs, and grapes, soil management of orchards, causes of uneven ripening of Concord grapes, fertilizers for grapes, and rootstocks for grapes, all by F. B. Cross; the effect of fertilizers on the handling qualities of strawberries, strawberry, blackberry, and raspberry variety comparisons, and culture of raspberries, all by I. C. Haut; and fertilizers for asparagus and tomatoes, and comparisons of varieties of melons, cabbage, cucumbers, and tomatoes, both by E. F. Burk.

[**Horticultural Studies by the Oregon Station**] (*Oregon Sta. Bul. 334 (1934), pp. 31, 32, 34, 47–49, 50, 57, 58, 60, 61, 71, figs. 4*).—Summaries are presented of investigations on the possible existence of toxic residues in orchard soils following spraying, the development of chemically treated paper wraps for fruit, development of blight-resistant pear stocks, breeding of strawberries, hybridization of Asiatic and cultivated *Rubus* species, utilization of cull pears for manufacturing levulose and sirups, preserving quality of fruits as indicated by chemical analyses of the canned and frozen product, the production of tomatoes under greenhouse conditions, vegetable irrigation trials, and the influence of different quantities of moisture in a heavy clay soil on the rate of growth of pears, by M. R. Lewis, R. A. Work, and W. W. Aldrich.

Medford Substation studies briefly mentioned include penetration of irrigation water into soils, time and amount of irrigation for pears, and effect of soil moisture upon vegetative and reproductive growth.

Southern Oregon Substation studies include comparisons of different pear species as stocks, tests of quinces as pear stocks, and pear pollination.

[**Horticultural studies by the Washington Station**] (*Washington Sta. Bul. 305 (1934), pp. 26, 27, 42–45, 46, 47, 63*).—Among studies discussed in a brief manner are the chemical composition of maturing apples, by R. F. Cohee and J. L. St. John; protecting fruit trees from winter injury, effect of oil sprays on apple trees, and spray residues on apples and pears, all by E. L. Overholser and F. L. Overley; development of methods of propagating hardy apple stocks, and peach harvesting and packing, both by O. M. Morris; alfalfa and sweetclover as orchard cover crops, by Morris and Overley; apple fertilization, by Overholser, Overley, and G. W. Young; pear fertilization, by L. L. Claypool, Young, and Overholser; orchard irrigation, by Claypool and Young; red raspberry and strawberry breeding, by C. D. Schwartze; and tomato breeding, by C. L. Vincent.

In addition a brief report is given by D. J. Crowley on the hardiness of blueberry flowers and the breeding of blueberries as conducted at the Cranberry-Blueberry Branch Station.

Plant forcing with electric lights, R. B. Withrow (*Indiana Sta. Circ. 206 (1934), pp. 12, fig. 1*).—Based on results secured at the station and by various other research agencies, information is presented relative to the equipment and cultural practices employed in the forcing of various greenhouse plants with modifications in the light supply. It was found that many species respond to relatively low light intensities, such as produced by 15- to 40-w Madza lamps of either clear or inside frosted glass. Lamps designed for ultraviolet radiation were not found useful, and in fact in many cases were harmful when used for the periods of time recommended for plant lighting. In presenting information for specific plants the author points out that greenhouse crops may be classified into three general groups with respect to light response, (1)

those, such as the rose and carnation, which fail to produce marked results, (2) those which give earlier or increased flowering, or both, such as the China aster, stock, Shasta daisy, and pansy, and (3) plants such as the perennial chrysanthemum in which flowering is delayed by additional light.

Greenhouse soil treatments, W. S. BALCH (*Market Growers Jour., 56 (1935), No. 5, pp. 118, 119*).—Comparisons at the Kansas Experiment Station of steam, formaldehyde, acetic acid, creolin, and no treatment for the control of nematodes and greenhouse soil sickness showed steam to be the only agent that would control nematodes. Formaldehyde was almost as satisfactory as steam where nematodes were absent. Creolin was of no value in controlling nematodes but in their absence was followed by the largest net returns. Acetic acid was effective in the absence of nematodes.

Soil acidity and plant growth, L. C. CHADWICK (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 14–26, fig. 1*).—Discussing the scientific aspects of soil reaction influences on plants, the author reports that at the Ohio Experiment Station German iris responded favorably to a neutral to slightly alkaline environment, and that at pH 4.5 and 5 growth was stunted and tipburning was prevalent. *Lupinus hartwegi* germinated and grew well at from pH 5 to 8. *Delphinium ajacis* thrived from 6.5 to 8 and *Daphne cneorum* from pH 7 to 8. A combined application of ferrous sulfate and sulfur to the soil surrounding pin oaks was beneficial in the control of chlorosis.

[Vegetable studies at Cheshunt] (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 19 (1933), pp. 16–35, 78–108, figs. 11*).—The subject is presented in the following papers:

Experimental results of 1933, [W. F. Bewley] (pp. 16–35).—No conspicuous differences were observed between several forms of nitrogen, namely, sulfate of ammonia, nitrate of soda, cyanamide, nitrate of lime, hoof and horn, dried blood, Peruvian guano, fish meal, and shoddy, when used as fertilizers for greenhouse tomatoes. The largest yield in 1933 was produced on the cyanamide plats, but in an average of 4 years' yields hoof and horn led. Planting tomatoes at the bottom of trenches with later filling did not prove practical. Radio No. 1 produced the highest yield among 21 varieties of tomatoes tested. Some progress was made in the breeding of leaf mold resistant varieties. None of several amendments, such as straw, peat, refuse hops, and chrysanthemums, added to the soil in tomato houses in an attempt to offset the need of annual changing of soil proved fully satisfactory. Heating of soil with buried hot water pipes stimulated yields and suggested that heating may to some extent replace sterilization. Peat was promising but too costly. Liming experiments indicated that the tomato tolerates considerable acidity, and that lime is chiefly beneficial in improving the physical condition of the soil.

Heating the soil of cucumber houses with buried electric cables proved distinctly beneficial. Progress was made in the development of a forcing lettuce that would head during the short days of winter.

Chemical investigations, O. Owen (pp. 78–83).—Determinations of nitrates in heated and unheated soils of tomato houses showed a lower concentration in the heated lots, suggesting either reduced nitrification or a greater assimilation of nitrates. Where hop refuse was incorporated, both water and nitrate contents were higher. More potash was found in the drainage water from fallow and unmanured plats than from manured and cropped areas. The omission of potash from the nutrient supply reduced sharply the total nitrogen per gram in chrysanthemum plants. The omission of phosphates increased the nitrogen contents of carrot foliage and bean pods and foliage and depressed the nitrogen in carrot roots, beet tops and roots, and in cabbage. Except in the case of carrot foliage the omission of nitrogen depressed the nitrogen content in all

plants. The omission of potash increased the nitrogen content of carrot roots and foliage and depressed nitrogen in beet roots and bean foliage. A lack of potash had little effect on cabbage and beet foliage and bean pods.

The influence of light and temperature on the assimilation rate of seedling tomato plants, variety E. S. 1, B. D. Bolas (pp. 84–87).—Observations on tomato seedlings grown under controlled light and temperature conditions showed that for any particular light intensity there is one temperature at which the assimilatory apparatus of the plant functions most efficiently. For example, at 600 foot-candles the assimilation attained the maximum at about 75° F.

Water-content and assimilation of seedling tomato plants, R. Melville (pp. 87–92).—Studies of the relation of water content and assimilation in tomato seedlings showed a seasonal drift of water content from a summer value to a higher winter value. The uniformity of the drift was broken by the effect of starting the heating system. The assimilation rate increased with rising water content to an optimal value, declining thereafter.

Some aspects of translocation in the seedling tomato plant, I. W. Selman (pp. 93–97).—Observations on the seasonal trend of translocation in young tomato plants showed that in summer the ratio of the percentage of assimilate translocated to the gain in dry weight approximates a constant fraction, but that toward the end of October the ratio changes, reaching an apparent maximum at the end of November. Translocation rate apparently declined with a rise in light intensity, reaching a minimum at about 1,000 foot-candles and then rising again. It is believed that this last rise is due to an increase in soluble carbohydrates or possibly to changes brought about by closing of the stomata.

Plant injury following the burning of sulphur in glasshouses, W. H. Read and O. B. Orchard (pp. 98–100).—Extensive damage observed on chrysanthemum foliage following fumigation with burning sulfur was found due to the presence of zinc sulfate dripping from painted surfaces. Dusting of pipes, floor, and bench work with flowers of sulfur caused no injury.

Conditions which affect the quality of tomatoes, W. F. Bewley, W. H. Read, and O. B. Orchard (pp. 100–108).—A study of tomato fruits arriving on the market in poor condition indicated that there are five distinct types of injury (1) blotching due to inadeqnate potash, (2) green back due to lack of potash plus exposure to too much sunlight, (3) mosaic injury, (4) mottling dne to poor growth and high temperatures, and (5) premature softening due to poor ventilation in transit.

The home vegetable garden, A. E. Hutchins (*Minnesota Sta. Bul. 315 (1935), pp. 63, figs. 18*).—This is a comprehensive discussion on the planning, planting, and care of a home vegetable garden and the storage of the resulting products. Included is a section on insect pests prepared with the assistance of A. C. Ruggles and a section on diseases by J. G. Leach. The various vegetables are classified according to their temperature requirements, and information is given as to the frost-free periods in various towns of the State.

The hop industry, H. H. Parker (*London: P. S. King & Son, 1934, pp. X+327, pls. 8, figs. 5*).—This English text presents information on the history, economics, cultural practices, and utilization, supplemented with tabular information on acreage, imports, prices, etc.

Stem anatomy of tomato, Lycopersicum esculentum L., R. S. Clark (*Penn. Acad. Sci. Proc., 6 (1932), pp. 60–62*).—This is largely a discussion of the origin of the internal phloem tissues.

Boron-iron relationships in the growth of tomato, W. E. Loomis and J. J. Wilson (*Iowa Acad. Sci. Proc., 40 (1933), pp. 55–56, fig. 1*).—Studies at

the Iowa State College in which boron was supplied in connection with $FeCl_3$ to tomato plants growing in cultural solutions failed to show evidence of any interaction of the iron and the boron, thereby refuting the assertion that the favorable action of boron may lie in its capacity to reduce the toxic action of iron rather than functioning as a specific essential element.

Problems in the fruit tree nursery, H. B. Tukey (*Amer. Nurseryman, 61 (1935), No. 4, pp. 3–6, figs. 3*).—This is a comprehensive discussion of modern nursery practice, with particular reference to the results of studies at the New York State Experiment Station. Among subjects discussed are the production of seedlings, uniformity in understocks, dwarf stocks, the best stocks for various fruits, the effect of the intermediate stem piece on the root and scion, the principal varieties of fruits, and new and promising fruits.

Utilization of land types for fruit production, Berrien County, Michigan, J. O. Veatch and N. L. Partridge (*Michigan Sta. Spec. Bul. 257 (1934), pp. 87, pl. 1, figs. 70*).—As a beginning of a proposed inventory of the resources of the State in fruit lands, the authors present the results of a study of the soil types of Berrien County and their value for fruit-growing purposes. Physiographically the county is divided into four major land divisions extending roughly parallel to the shores of Lake Michigan. Of these the plateau-like highland which occupies most of the southeastern and eastern parts of the county includes some of the land types of highest horticultural value—for example, the Eau Claire. A total of 17 land types are discussed, their location and principal features indicated, and their value for orchard purposes discussed. Data on precipitation and temperature in the county are presented. The most favorable soils for horticultural crops were not necessarily the most fertile but rather those which permitted of successful tillage and free root penetration, with a subsoil capable of holding a reserve of moisture within reach of the trees. The most unfavorable soils were the deep dry yellowish sands and the wet soils, clays, sands, and mucks. Of the various land types the Eau Claire, Three Oaks, and Fairplain are given the highest rating for all classes of fruits.

Removal of poisonous spray residues on fruit, R. H. Robinson (*Indus. and Engin. Chem., 25 (1933), No. 6, pp. 616–620, figs. 3; abs. in Oregon Sta. Bul. 334 (1934), p. 74*).—This is a general discussion of the spray residue problem, with special reference to the necessity of removing poisons, washing with dilute hydrochloric acid and various alkaline reagents, temperatures of the washing liquids, washing equipment, costs, etc.

Studies on firmness and keeping quality of certain fruits, I, II (*Maryland Sta. Bul. 366 (1934), pp. 43–99, figs. 3*).—These studies are reported in two parts.

I. *Effects of nitrogen fertilization,* E. S. Degman (pp. 51–68). The results of studies with apples, peaches, and strawberries grown in different sections of the State are discussed. In no case was there found any direct influence of nitrogen on the firmness or keeping quality of the fruits, indicating that fruits of similar size, maturity, and color will have comparable storage quality irrespective of nitrogen treatment. The apples from the nitrated trees contained more nitrogen and had a higher respiration rate than did the controls. With peaches and strawberries, nitrogen treatment had little effect on the nitrogen content of the fruit. Total sugars and sucroses were the only other constitutents to be affected materially by nitrogen applications. The author emphasizes the fact that nitrogen by its influence on size, color, and time of maturity may indirectly influence keeping quality, but points out that such influences are no greater than would result from various pruning, fruit thinning, and cultural practices. He advises that strawberry growers should

be particularly cautious, because overstimulation from nitrogen may cause excessive growth and oversized berries with a tendency to decay.

II. *Effects of potassium fertilization*, J. H. Weinberger (pp. 69–96).—This paper also includes data on apples, peaches, and strawberries and presents the general conclusion that potash did not improve the shipping or keeping quality of peaches and strawberries. One form of potash, namely, sulfate of potash magnesia, did definitely increase the firmness and improve the keeping quality of apples, although under normal seasonal conditions the effect was too slight to be of any practical significance. The use of potassium muriate, potassium sulfate, and kainite produced no appreciable effects on either firmness or keeping quality. Phosphatic fertilizers used with potassium had no influence on firmness or keeping quality of apples, peaches, or strawberries.

Preliminary reports on both of these studies were previously noted (E. S. R., 64, p. 36).

Distribution of temperature in a stack of fruit, A. J. M. Smith ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 207–209*).—*Four years'* work with a variety of systems of cooling and of stowage failed to show any advantage of any form of dunnage inside the stack when the air is circulated at a rate of 15 changes per hour or more.

Frozen fruits and vegetables, T. N. Morris and J. Barker ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 77–80*).—Observations on strawberries after 8 mo. of storage at −10° and −20° C. showed greater deterioration at the warmer temperature. With raspberries and currants the differences in color and flavor due to temperature were insignificant. Gooseberries at −10° showed distinct yellowing as compared with −20°. Raspberries stored at −5° were after 5 mo. slightly paler and softer than those held at −10°. Vacuum and carbon dioxide storage offered no improvement. Ettersberg strawberries were found to be well adapted to freezing storage. White cherries frozen in vacuum or in carbon dioxide did not differ perceptibly after 5 mo. from fruit frozen in the air. Quick freezing of asparagus in cans immersed in brine at −20°, with subsequent storage at −20°, gave good results. As little as 1 min. of blanching of peas prior to storage at −10° gave promising results. When tap water was compared with softened water for blanching peas, no differences were detected in texture of the frozen product except in one case. Some indication was obtained of the desirability of the prompt freezing of blanched peas.

Orchard soil management, F. W. Faurot (*Missouri Fruit Sta. Bul. 28 (1934), pp. 18, figs. 4*).—Arkansas and Ingram apple trees planted 4.5 ft. apart and grown part under grass sod and part under tillage with cover crops were dug at the end of 4 yr. The results showed that the largest trees were on the tilled, cover cropped, and manured plat and the smallest trees on the sod plats. The trees from the best plat were over seven times the weight of those from the poorest area. The addition of nitrogen and phosphorus to the sod had little or no effect on the trees.

Observations on 12-year-old interplants dug from an orchard established in 1921 again showed the harmful effect of grass culture unless supplemented with nitrogen fertilizers. The trees from the straw-mulched plat not only made the greatest growth but were also most productive. In a second orchard planted in 1919 tillage plus manure produced the highest yields. In an older orchard set out in 1902 the straw-mulched plats led in both yield and growth, as indicated by trunk circumference increment. However, straw mulching is not considered practical because of a scarcity of straw and the fire hazard. Tillage supplemented with organic matter either as manure or as turned under cover crops is suggested as the most desirable treatment.

Spraying and dusting apples: Costs, grades of fruit, returns, H. W. Thurston, Jr., and H. N. Worthley (*Pennsylvania Sta. Bul. 311 (1934), pp. 15, figs. 2*).—Five years' records taken in blocks of Rome Beauty and Baldwin trees 12 yr. old at the beginning of the experiment in 1929 showed that dusting was considerably more costly than spraying. The data showed that spraying costs reached 18 and 17 percent and dusting 35 and 31 percent of the total production costs for Rome Beauty and Baldwin, respectively. Spraying gave the better protection of Rome apples, while in Baldwin the dusted trees packed out 13 percent more fruit in the upper three grades than did the sprayed trees. For scab-susceptible varieties spraying is considered a more reliable protection than is dusting. Although the figures presented represent a given set of conditions and would vary with local costs and prices, the authors believe that the comparisons set forth are highly significant and pertinent to the average situation.

Spray residue removal from apples, M. H. Haller, J. H. Beaumont, C. R. Gross, and H. W. Rusk (*Maryland Sta. Bul. 368 (1934), pp. 121–136*).—Experiments conducted in cooperation with the U. S. Department of Agriculture and employing three different washers, namely, (1) flood type with towel drape drier, (2) impeller-flood type with air blast drier, and (3) home-made flotation type with no facilities for drying, showed no particular advantage for any one type of washing machine. Dry wiping or brushing machines were decidedly less effective than washers and are said to be useful when the residues only slightly exceed the tolerances. Hydrochloric acid was found effective in cleansing fruit. A solution of 0.5 percent by weight in water is recommended for cleansing residues from apples sprayed with lead arsenate and a fungicide without oil. For fruit difficult to clean, the efficiency of the acid solution was increased by increasing the concentration of the acid up to 1.5 percent, by adding 1 to 2 percent of salt and 0.5 to 1 percent of a wetting agent, by heating the solution to 100° F., or with any combination of these treatments. Sodium silicate proved relatively ineffective at room temperatures and even when heated was usually considerably less effective than the less costly hydrochloric acid. Storage quality of apples was not impaired by proper washing and rinsing operations.

Latest developments in washing apples, R. H. Robinson (*Jour. Econ. Ent., 27 (1934), No. 1, pp. 162–167; abs. in Oregon Sta. Bul. 334 (1934), p. 76*).—This contribution from the Oregon Experiment Station summarizes the status of spray residue removal knowledge. Of the various solvents tested, only hydrochloric acid and sodium silicate were found really useful. Hydrochloric acid is said to be much more rapid in action than sodium silicate and may be used at lower temperatnres. Sodium silicate, on the other hand, when supplemented with soap removed part of the waxy filament and its adhering residnes. The need of a carefully planned spray program to leave a minimum of toxic residues is urged.

The iodine-starch reaction as a test for maturity of apples, L. W. Tiller (*New Zeal. Jour. Sci. and Technol., 16 (1934), No. 2, pp. 88–101, figs. 8*).—Studies at the Government Research Orchard, Nelson, New Zealand, indicated that the iodine test has no value in establishing the earliest date on which it is advisable to commence picking Delicious and Statesman apples, and that the test is of very doubtful value in the case of the Sturmer variety. Uncompleted studies with Cox Orange and Jonathan suggested that individual variation may prove so great as to mask the effect of the time factor on the hydrolysis of starch.

Chemical work on fruit, D. Haynes and H. K. Archbold (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 225–228*).—Analyses of small plugs of pulp removed from different parts of a single apple showed a decreasing concentration gradient of sugar from the blushed to the unblushed

side and also from the calyx to the stem. The desirability of halving the apple by cutting through the blushed surface is suggested. Further analyses showed a gradient of increasing sugar concentration from the core outward, with acid concentration reversed. A respiration test with apples from the same population showed slight difference in carbon dioxide output between the inside and outside portions of the pulp. The results of the study indicate that the half apple method of sampling may be increased in accuracy.

The effects of ethyl alcohol upon the respiratory metabolism of apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 60–67, figs. 2*).—The higher level of acetaldehyde observed in fruits stored under anaerobic conditions is explained on the basis of a probable lower rate of aldehyde consumption in the purely fermentative system than would take place in the presence of molecular oxygen. A progressive decline in the rate of alcohol formation of pears held 84 days in atmospheres containing not more than 0.2 percent of oxygen led to studies in which apples were placed in desiccators over different concentrations of ethyl alcohol. The fruit held over 5 and 15 percent alcohol showed no visible injury in 5 weeks, while those over 99.5 percent alcohol showed superficial browning in 5 days and were browned throughout after 14 days. The largest amount of alcohol was taken up by the tissues of the core, indicating that the cuticle is resistant to vapors. The rate of production of carbon dioxide in air by healthy apples was decreased when moderate quantities of ethyl alcohol were introduced into the tissues, whereas large quantities increased the rate.

The acetaldehyde and ethyl alcohol contents of apples during storage, A. C. Hulme (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 70–73, fig. 1*).—A gradual increase in the acetaldehyde and ethyl alcohol content of the tissue of Worcester Pearmain apples stored at 1° and 4° C. in a synthetic atmosphere consisting of 21 percent oxygen and 79 percent nitrogen is believed to indicate that normal senescence in the apple is accompanied by a gradual failure of the oxidative mechanism presumably responsible for the nonaccumulation of acetaldehyde and alcohol in healthy tissue. There was very little difference in the effects of the two temperatures on the aldehyde and alcohol changes.

The cause of low-temperature breakdown in apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 57–60, figs. 2*).—Observations on the respiratory activity of Bramley Seedling apples held at 50° F. after harvest showed a typical climacteric rise after 10 days, with the maximum reached after from 20 to 30 days. When removed to 34° a striking parallelism was noted between the amount of low temperature break-down and the state of the fruit with regard to the climacteric rise in respiratory activity. It is concluded that the apple breaks down sooner when the fruit is placed in cold storage at the peak of the climacteric than before or after. At 34° the development of an inherent tendency to break-down took place 2 mo. before any break-down was apparent.

Gas-storage of apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 193–199*).—Trials with Monarch, Cox Orange, Blenheim Orange, and Worcester Pearmain apples stored at three different temperatures, 1°, 4°, and 10° C., in 10 different synthetic atmospheres showed definite optimum requirements. Monarch apples kept best at 1°, whereas Cox Orange kept best at 4°.

The influence of the composition of the atmosphere upon the incidence of the climacteric in apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 51–57, figs. 4*).—In addition to

ripe apple vapors reported previously (E. S. R., 71, p. 637), it was found that the unidentified volatile products of ripe bananas, pears, peaches, and tomatoes also hastened the maturity of apples. The volatile products of grapes, fully colored oranges, and certain mature leaves had no effects. Vibration, cutting, and brief exposure to 0° C. did not hasten the climacteric. Sturmer apples exposed to vapors of odorous postclimacteric apples developed their climacteric immediately, while apples ventilated with fresh air did not start for from 10 to 14 days. Once initiated, the actual duration of the climacteric was about the same in both cases. Comparable results were secured with Newton Wonder apples except that fruits ventilated slowly developed a climacteric sooner than those more rapidly ventilated. The wrapping of Newton Wonder apples in oiled wrappers had no effect on the initiation of the climacteric. The exposure of Bramley Seedling apples in the late preclimacteric stage to an atmosphere of pure oxygen at 18° C. greatly accelerated the incidence of the climacteric, whereas subnormal concentrations of oxygen delayed the onset. With 0.3 percent or less of oxygen, treatments with ethylene had no effect on respiration. Work with carbon dioxide showed this gas to delay markedly the onset of the climacteric.

Injurious effects of atmospheres of pure oxygen upon apples and pears at low temperatures, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 74–77, fig. 1*).—Bramley Seedling apples stored at 1° and 4° C. in nearly pure nitrogen remained green and dry. After about a month brown areas appeared on certain apples, but even after 7.5 mo. 16 percent of the fruits showed no injury. The sound flesh was firm, very acid, and slightly alcoholic in taste. In pure oxygen yellowing took place rapidly, the skins became greasy, and within 2 mo. the flesh was becoming mealy. In 4 mo. all of the apples were brown and dead. In an atmosphere of 5 percent oxygen and 95 percent nitrogen yellowing occurred, followed by fungal rotting. Analyses revealed a lesser loss of sugar in nitrogen-stored than in oxygen-stored fruits. There was a conspicuously greater development of ethyl alcohol and acetaldehyde in the oxygen-stored apples.

Cherries of Utah, F. M. Coe (*Utah Sta. Bul. 253 (1935), pp. 72, figs. 26*).—Largely devoted to the description of varieties of sweet, sour, and Duke cherries, this paper discusses the history of cherry culture in Utah, the present status of the industry, and the outlook for the future. In a test orchard established in 1928 at the Davis Experimental Farm Napoleon, Bing, Lambert, and Black Tartarian led the sweet cherries in vegetative development after 5 yr. Early Richmond and Dyehouse made the best growth in the sour group, and Reine Hortense was the most vigorous of the Dukes. In the severe winter of 1932–33 when −18° F. was recorded in December, Windsor, Lambert, Yellow Spanish, Major Francis, Abundance, and Seneca proved most resistant among sweet cherries to cold. Of the two most promising commercial sweet cherries, Bing and Lambert, the latter is considered most desirable for commercial uses, both on account of the quality of the fruit and the hardiness and productivity of the tree.

A promising variety of plum, O. C. Medlock (*Alabama Sta. Rpt. 1933, p. 31*).—Observations are presented on the performance of the Methley plum.

Prune maturity studies, C. C. Vincent (*Idaho State Hort. Assoc. Proc., 38 (1933), pp. 180–182*).—Based on studies conducted by the Idaho Experiment Station, the author states that prunes for immediate eastern shipment should be harvested at pressures ranging from 12 to 8.5 lb. Storage of Italian prunes at from 32° to 35° F. for short periods is said to be practicable, but stored fruits must be moved in time to reach retail markets before the pressure falls below 7 lb.

Studies of the causes of cull cherries showed Bing culls to contain 12 percent of doubles, 69 percent of bruised, 8 percent of small, and 4 percent of stemmed fruits. In Lambert the culls contained 22 percent of doubles, 8 to 21 percent of bruised, 17 to 20 percent of small, and from 20 to 33 percent of stemmed fruits. The percentage of double cherries differed markedly from year to year. Cherries picked fully ripe kept better than those picked when first colored.

The Japanese persimmon in Tennessee, B. D. DRAIN (*Tennessee Sta. Circ. 51 (1934), pp. 4, figs. 4*).—General information is presented on botanical characters, culture, propagation, varieties, etc.

The influence of environmental factors on the development of the pollen, pistil, and fruit in the strawberry, J. E. VAILE (*Abs. Thesis, Univ. Ill., Urbana, 1933, pp. 7*).—Employing a total of 19 horticultural varieties and 5 species, namely, *Fragaria virginiana*, *F. chiloensis*, *F. cuneifolia*, *F. moschata*, and *F. vesca*, the author reports that high nutrition and the resulting vigorous growth appeared to suppress the development of the anthers, particularly in certain varieties, such as Premier (Howard 17) and Blakemore. In all varieties there was a decrease in pollen abortion in the latest flowers of the cluster. In photoperiod studies the author observed that the size of the inflorescence and the length of the peduncle were reduced by short days. Easypicker did not produce a single flower under a 5-hr. day. Pollen abortion reached a maximum in the 5-hr. plants.

Cytological studies of the developing ovules showed that the customary 8 nuclei in the embryo sac may often be reduced to 2 to 5 in number. There were proportionately more abnormal embryo sacs in the pistils of late blooms and in pistils of low nutrition cultures. Apparently the number of nuclei in the embryo may be influenced by food supply, thereby giving the results of the study a practical outlook.

Growing grapes in West Virginia, H. E. KNOWLTON and W. H. CHILDS (*West Virginia Sta. Circ. 69 (1935), pp. 24, figs. 5*).—General information is presented on the establishment and maintenance of vineyards. Included is information on varieties, training, pruning, culture, control of insect and fungus pests, etc.

Preliminary studies on the marcottage of the avocado, A. SAN PEDRO (*Philippine Agr., 23 (1935), No. 8, pp. 681–688, figs. 3*).—Successful propagation of the avocado by marcottage was secured at the University of the Philippines in a few instances where shoots were ringed twice, once at the beginning and again after callusing had started. Prominent protuberances in the upper region of the ring were believed to contain root primordia, which, when the lower part of the callus was again scraped to prevent healing, put forth roots. The application of a 1-percent potassium permanganate solution to the wounds did not hasten rooting.

Metabolic constants of bananas, R. GANE (*[Gt. Brit.] Dept. Sci. and Indus. Res., Food Invest. Bd. Rpt., 1933, pp. 131–137, figs. 5*).—Observations on bananas obtained from ships while the fruit was still dark green and exuding sap freely from cuts showed ripening to proceed in a normal manner between 54° and 86° F. Above 86° the rate of respiration dropped rapidly after the climacteric rise, yellow color failed to develop, and the pulp was soft and watery. Transfer of mature bananas to 0° C. for 5 days resulted in a marked accumulation of alcohol and acetaldehyde in the tissues. In a synthetic atmosphere of 10 percent oxygen, 10 percent carbon dioxide, and 80 percent nitrogen the rate of respiration of ripe bananas was reduced to 75 percent of the value in air.

Pecan seedling rootstock studies, S. H. YARNELL (*Tex. Pecan Growers Assoc. Proc., 14 (1934), pp. 15–17*).—Observations by the Texas Experiment Station on open-pollinated seedlings of various varieties and identified trees

showed well-defined differences in growth due to parentage. In 1933 Hollis seedlings rated first among those of named varieties in height development. Oliver seedlings, which ranked second in average height, rated first in diameter. In general, height and diameter growth were apparently well correlated. The performance of any given seedling population was influenced by the locality in which grown. The importance of good heredity in the production of pecan seedlings for budding is stressed.

Influence of variation in storage temperature on growth of gladiolus and on gladiolus thrips, A. M. S. Pridham and F. R. Shaw (*New England Gladiolus Soc. Year Book, 1934, pp. 84, 85*).—At Cornell University Lucette gladiolus corms treated with naphthalene flakes at the rate of 1 oz. to each 100 corms showed no evidence of thrips following storage. There was a 5.9 percent reduction in the number of flower spikes, but no significant effect of naphthalene on date of flowering or the number and weight of new corms produced. As to temperature effects, gladiolus corms stored at 60° F. lost 30 percent of their weight during storage and when untreated with naphthalene showed an increasing infestation of thrips. At 32° the weight loss was 17 percent, and thrips infestation was suppressed. The date of flowering was advanced by storage of the corms at low temperatures.

Hardy trees and shrubs for western Kansas, E. W. Johnson (*Kansas Sta. Bul. 270 (1934), pp. 32, figs. 17*).—Following a discussion of soil preparation, planting, pruning, and general cultural care, there is presented information on plant materials—their outstanding characteristics and adaptability to various uses and environments.

FORESTRY

The role of light in the establishment of the upper limits of forests: Observations made in the Canton of Grisons [trans. title], P. Collaer (*Ber. Schweiz. Bot. Gesell., 43 (1934), No. 1, pp. 90–125, pls. 2, figs. 16*).—The author presents evidence from his extensive comparative analyses and tests which supports the view that increasing light intensity is an important factor in establishing the upper altitude limit for *Picea excelsa*. This is held due to the effects of the violet and ultraviolet rays in diminishing the diastatic action in the needles. With this species, the effect of the rays in the red-orange region was found to decrease the amount of chlorophyll in the needles progressively with increasing altitude, beginning at 1,650 m, though the rate of photosynthesis was apparently not diminshed thereby.

With *Larix decidua* chlorophyll decrease started at 2,100 m, but there was no decrease in diastatic action even at the upper limit of growth. With *Pinus cembra* no unfavorable action of increased light intensity was observed up to the limit of growth at 2,250 m. Other factors besides light, therefore, are also important in establishing altitude limits.

Species composition of burned and unburned forest plots, L. M. Ware (*Alabama Sta. Rpt. 1933, p. 30*).—This includes observations on a cut-over pine area.

Some chemical and physical effects of forest fires on soil, G. S. Perry (*Penn. Acad. Sci. Proc., 5 (1931), pp. 123–127*).—Following a disastrous forest fire near Mont Alto, Pa., observations were made on the soil from locations where the fire burned with different degrees of intensity. By liberation of electrolytic elements forest fires decreased temporarily the acidity of the soil. Apparently fire did not increase the fineness of the soil, as determined by shaking through sieves after crushing with a wooden pestle. Even the surface

fire did not remove all of the organic matter from the soil or even from the upper peaty layer.

The effects of black locust on associated species with special reference to forest trees, A. G. CHAPMAN (*Ecol. Monog., 5 (1935), No. 1, pp. 37–60, figs. 12*).—Studies in plantations in Ohio and Indiana showed that wherever black locust is growing adjacent to such species as catalpa, oak, and white ash there is an appreciable increment in growth of the associated species correlated directly with their proximity to the locust. Analyses of soil collected at regular intervals from the locust showed reductions in total nitrogen as the distance increased. Definite decreases in the number and vigor of ground cover species were also observed as the distance increased.

Nodulation reached a maximum in the upper 4 in. of soil where moisture, aeration, and organic matter conditions were apparently most favorable. No correlation could be established between soil reaction and degree of nodulation in the plantings under observation.

In small control plats of black locust and Chinese elm seedlings, significant increases were detected in the amount of total nitrogen during the second growing season in the soil and in the leaves of elms interplanted with locust. At the same time there were significant decreases of total nitrogen in the pure elm plats.

Some tree antagonisms, G. S. PERRY (*Penn. Acad. Sci. Proc., 6 (1932), pp. 136–141*).—Observations in a 22-year-old white pine plantation located near Mont Alto, Pa., in which were scattered trees of locust showed on moist sites an almost complete extermination of the white pine near the locust trees. These and other similar observations suggested the possibility of a secretion by the locust of some active principle or toxic substance which interfered with the metabolism of the white pine.

Variations in the composition of latex from clone and seedling rubber, J. L. WILTSHIRE (*Rubber Res. Inst. Malaya Bul. 5 (1934), pp. [2]+II+61, pls. 12, figs. 20*).—Comparative studies of the latex from high and low panels revealed a higher dry rubber content and viscosity in the product of the upper cut and a higher percentage of total ash, potassium, and phosphoric acid in the lower cut. Of four clons, one was characterized by high dry rubber content and viscosity and low ash content, but the percentage composition of the ash was similar in all. Clonal differences in the seasonal variability of the several constituents were in some instances associated with differences in dormant season habits of defoliation and refoliation. There was noted a tendency for high yield to be associated with low dry rubber content and high ash content. The effect of opening two cuts at different heights on a single tree was to eliminate the difference in dry rubber content shown by similar cuts on different trees, but differences in ash were not eliminated.

The rubber content of two species of Cryptostegia and of an interspecific hybrid in Florida, L. G. POLHAMUS, H. H. HILL, and J. A. ELDER (*U. S. Dept. Agr., Tech. Bul. 457 (1934), pp. 23, pls. 9, figs. 2*).—Following a botanical description of the species concerned and an account of the discovery of an interspecific hybrid and its variation from the parental species *C. grandiflora* and *C. madagascariensis*, the authors present the results of analyses of the rubber content of the mature leaves of the several forms as grown in the U. S. Plant Introduction Garden at Coconut Grove, Fla. The maximum rubber contents determined in the dried leaves were 3.34, 3.14, and 8.6 percent, respectively, in *C. grandiflora*, *C. madagascariensis*, and the interspecific hybrid. The rubber content varied with the season, attaining a maximum during the period of greatest vegetative development. The rubber content of the leaves

of the hybrid increased in direct proportion to leaf maturity, reaching a maximum at the age of about 3.5 mo. Air layering or marcottage was found to be a satisfactory method of propagating a hybrid. Resins and fiber byproducts are deemed of possible economical value.

Stumpage and log prices for the calendar year 1933, compiled by H. B. Steer (*U. S. Dept. Agr., Statis. Bul. 49 (1934), pp. 71, figs. 3*).—In a like manner to the preceding report (E. S. R., 71, p. 198), there is presented statistical information on price levels and demands for stumpage and logs during the calendar year 1933.

DISEASES OF PLANTS

Treatise on plant pathology, G. and M. Arnaud (*Traité de pathologie végétale. Paris: Paul Lechevalier & Sons, 1931, tome 1, vols. 1, pp. 933, pl. 1, figs. 355; 2, pp. 994–1831, figs. 347; atlas, pls. 34*).—These two volumes comprise the first part of what is expected to be the most comprehensive modern work on plant pathology in the French language. The first deals with the diseases of grapes (over 500 pages being devoted to this subject), general diseases of fruit trees, and diseases of the apple, following an introductory chapter on the nature of plant diseases and methods of control. The second volume continues with the diseases of pear, quince, other pome fruits, stone fruits (peach, almond, apricot, prune, plum, and cherry), bush fruits (*Ribes*, *Rubus*, and *Vaccinium*), strawberries, and Mediterranean fruits (olive, citrus, mulberry, pomegranate, loquat, Japanese persimmon, carob, pistachio, jujube, and date).

Major emphasis is given to diseases of fungus origin, but disorders due to climatic and soil conditions, bacteria, and viruses are also given consideration and insect pests are discussed very briefly in each case. Lists of references are given for each disease. The unusual fidelity of the colored plates and the general excellence of the black and white illustrations provide effective aid to the recognition and understanding of the maladies dealt with.

Diseases of cultivated plants, D. Atanasov (*Bolesti na kulturnitĕ rastenii͡a Sofiya (Sofia): Govt., 1934, pp. XV+626, figs. 221*).—The first chapter deals with general aspects of phytopathology, listing historical landmarks and giving in chronological order outstanding contributions to the general literature down to 1933. The second chapter (41 pages) deals with nonparasitic disorders, the third (120 pages) is devoted to virus diseases, the fourth (68 pages) to bacterial diseases, the fifth (332 pages) to diseases caused by fungi, and the sixth (20 pages) to parasitic flowering plants and to fungicides. Under each disease is given a discussion of its importance, of the symptoms, of the pathogenic agent, and of control practices, followed by pertinent references to the literature.

The volume is well illustrated and is provided with a host index.

[Plant disease investigations by the Alabama Station] (*Alabama Sta. Rpt. 1933, p. 26*).—A report is given by J. L. Seal on the *Mycosphaerella* disease of winter peas and on diseases of winter peas and vetches caused by *Ascochyta* species.

[Plant disease investigations in Kansas] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 94–98, 99, 100, 128*).—The following studies are summarized: The resistance of oat varieties, hybrids, and selections to composite collections of oat smuts (*Ustilago avenae* and *U. levis*); oat leaf blotch; the resistance of wheat to composite collections and a single physiologic form of bunt (*Tilletia* sp.); wheat treatment with copper carbonate and New Improved Ceresan against bunt; wheat flag smut; the relation of environmental and soil factors, influence of commercial fertilizers, and varietal susceptibility in reference to wheat take-all (*Ophiobolus graminis*); the relation of soil moisture and other

factors to the dry-land foot rot of winter wheat due to *Helminthosporium* spp. and other fungi; sorghum smuts (*Sphacelotheca sorghi* and *S. cruenta*) in relation to temperature and other environmental factors, physiologic specialization, and varietal resistance; varietal susceptibility of sorghum to the root, crown, and shoot disease of milo, with which *Fusarium* and *Pythium* species are associated; the treatment of seed potatoes with corrosive sublimate and other fungicides for *Rhizoctonia* control; the relation of environmental conditions to the severity of attack on the potato by soil-borne *Rhizoctonia*; biologic variation in *R. solani*; diverse effects of treating sweetpotato sprouts with copper and mercury fungicides for stem rot control; varietal resistance to sweetpotato stem rot; copper v. sulfur fungicides for cherry leaf spot; fungi and spray burn as causes of frogeyelike apple leaf spots; breeding and testing winter wheat for resistance to leaf rust (*Puccinia triticina*), winter injury, bunt, mildew, stem rust, and leaf blotch; physiologic specialization and epidemiology of leaf rust; and trials with iron sulfate and other materials for the control of chlorosis in trees and shrubs.

Plant disease studies, F. M. Rolfs (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 296–303*).—Reference is made to studies on the stem nematode (*Tylenchus* (*Anguillulina*) *dipsaci*), bacterial blight (wilt) (*Aplanobacter insidiosum*), and bacterial black stem (*Phytomonas* (*Pseudomonas*) *medicaginis*) as they affect alfalfa; data and conclusions are given of studies on sources of apple blotch infection in the orchard and in the nursery; and the results are given of tests to determine the best methods of cottonseed treatment for, and methods of dissemination of, the angular leaf spot organism (*Bacterium* (*Pseudomonas*) *malvacearum*.)

[**Plant disease studies in Oregon**] (*Oregon Sta. Bul. 334 (1934), pp. 37–39, 61, 71, fig. 1*).—The progress of studies is briefly reviewed on walnut blight control with bordeaux mixture and bacterial blight disease of filberts; hop downy mildew; virus diseases in ornamental bulbs; tomato tip blight and the viruses associated with it; curly top of vegetables; foot rot disease of wheat; control of strawberry root rot (*Rhizoctonia*); strawberry crinkle disease and the development of disease-free planting stock; rotation tests for the control of *Verticillium* wilt of black raspberries; spray program for control of leaf and cane spot of *Rubus*; control of little leaf disease with zinc sulfate; severe spotting and dropping of leaves caused by alkaline water used in orchard spraying; and the transmission by *Illinoia solanifolii* and *Myzus pelargonii* of a mosaic disease of bulbous iris, by P. Brierley and F. P. McWhorter.

[**Plant disease studies in Washington**] (*Washington Sta. Bul. 305 (1934), pp. 16–18, 45, 47–51, 63*).—Brief summaries are given of investigations on the inheritance of resistance in wheat to different physiological forms of bunt, by E. F. Gaines and A. M. Schlehuber; tests of zinc sulfate, zinc oxide, and metallic zinc in the treatment of little leaf of fruit trees, by E. L. Overholser, L. L. Claypool, and G. W. Young; stinking smut of wheat, its physiologic forms, its reduction by trench seeding and seed treatment, and its effect on winter injury, by F. D. Heald, Gaines, and C. S. Holton; apple rots due principally to *Penicillium* and *Botrytis cinerea*, by Heald and K. Baker; surface-borne fungi of wheat seed, by Heald and O. Schnellhardt; pear rots due to *Penicillium*, *Botrytis*, and other fungi, by Heald and H. English; bitter pit and related diseases of apple and pear, by Heald, Overholser, and F. L. Overley; vein-banding and other virus diseases of potatoes and other solanaceous plants, and red raspberry mosaic of brambles, both by L. K. Jones; downy mildew (*Peronospora pisi*) and powdery mildew (*Erysiphe polygoni*) of peas and their control, by L. Campbell and E. J. Anderson; *Verticillium dahliae* wilt of chrysanthemum, control practices and resistant varieties, by Jones and G. A. Huber; plant disease survey

for Washington, by Heald, Jones, and Huber; and control of cranberry fungi with a sulfur spray, by D. J. Crowley.

The "sooty moulds" of some Australian plants, E. E. Fisher (*Roy. Soc. Victoria, Proc., n. ser., 45 (1932), No. 2, pp. 171–202, pl. 1, figs. 25*).—An introductory account of the more recent work on sooty molds is followed by descriptions of those found near Melbourne on *Bursaria spinosa*, *Leptospermum scoparium*, *L. laevigatum*, *Myoporum insulare*, and *Melaleuca* sp.

Contribution to the study of the Uredinales in Seine-et-Oise.—VII, The activity of Puccinia glumarum in winter in the department Seine-et-Oise (southern region) [trans. title], G. Viennot-Bourgin (*Bul. Soc. Sci. Seine-et-Oise, 3. ser., 2 (1934), No. 3–4, pp. 21–36*).—The hosts of the stripe rust are listed. The physiologic races are discussed, and the 6-yr. observations of the author in this region are recorded. The propagation of the various biologic forms on the cereals is held to occur through their attack, immediately after harvest, on the volunteer seedlings or new sprouts, followed by dissemination to the seedlings of the normal fall planting in November and December. Here they sporulated autumnally in favorable years, but persisted in mycelial form under unfavorable conditions (e. g. dry cold), renewing activity with the return of more favorable weather.

The origin, recognition, and estimation of smoke injuries, E. Haselhoff, G. Bredemann, and W. Haselhoff (*Entstehung, Erkennung und Beurteilung von Rauchschäden. Berlin: Borntraeger Bros., 1932, pp. XII+472, figs. 36*).—This work deals with the origin and composition of smoke, the external signs and extent of smoke injuries, and the demonstration of smoke gases in the air injurious to plants, and presents a discussion of the results of chemical investigations on smoke injuries. The latter deals, in separate sections, with the different types of injurious chemicals which may be present in the smoke, with their effects on plant life in general, and on the soil, roots, and aboveground plant parts.

Next are given the results of botanical investigations of smoke injuries, in which are outlined the physiological effects and external and internal morphological changes in plants due to injuries from various substances contained in smoke, together with methods for the microscopic demonstration of these injuries in the plant tissues.

A section is devoted to the correct estimation of injury to vegetation by smoke. A bibliography is included.

Copper analysis of foliage sprayed with cuprous oxide, L. L. Isenhour and J. G. Horsfall (*Phytopathology, 24 (1934), No. 12, p. 1383*).—Nitric acid (0.2 percent) would not remove red copper oxide from sprayed foliage for quantitative analysis according to the common method employed successfully with bordeaux mixture. The addition of 1 percent hydrogen peroxide (30 percent solution) to the nitric acid solution, however, was found to result in the removal of all copper, usually within 30 min., and to permit the usual colorimetric analysis.

Pasteurizing soil electrically to control damping-off, J. G. Horsfall (*New York State Sta. Bul. 651 (1935), pp. 8, figs. 3*).—The equipment for partial soil sterilization in a cabinet provided with electric heating elements covered with aluminum fins is described. The results are given of tests of the consumption of electricity and of the effectiveness of the method. It was found that the pasteurization temperature need not go higher than 45°–50° C. for 12 hr. to destroy *Pythium ultimum*, *Rhizoctonia solani*, and *Botrytis* sp. (all causing damping-off), and most weed seeds (except clover and occasionally purslane), as well as nematodes and insects.

For economy, the soil heating chamber should be well insulated so as to maintain the desired temperature after the current is shut off. Care must be taken to avoid recontamination of the soil. The soil is not injured by this treatment, as is the case with steaming at higher temperatures.

Increased efficiency of chloropicrin for nematode control with better confinement of the gas, G. H. Godfrey, J. Oliveira, and H. M. Hoshino (*Phytopathology, 24 (1934), No. 12, pp. 1332–1346, figs. 2*).—In greenhouse tests at the Hawaiian Pineapple Experiment Station good results in control of the root knot nematode (*Heterodera marioni*) were obtained from the use of chloropicrin adequately confined in the soil with a highly impervious cover. Ordinary Kraft paper coated with a thin sizing of animal-product glue or casein glue, when placed over the soil and sealed at the edges, proved to be highly efficient. Chloropicrin, applied at rates of 300 and 350 lb. per acre in closed containers, with covers as described, gave better than 99 percent control, with 100 percent control in several cases.

The same technic applied to small field plats, with the covers sealed to metal or wood frames about the plats, gave good nematode control and resulted in remarkably increased vigor of plant growth when tomatoes were used as the indicator crop. Cowpea indicator plants did not show improved growth because of the lethal effects of the treatment on the beneficial legume-nodule bacteria.

Conditions essential to the high efficiency of chloropicrin fumigation for nematode control were found to be (1) complete decay of any residue in the soil of infested roots of a previous crop before treatment; (2) good loose tilth and absence of excessive moisture; (3) the use of from 250 to 400 lb. per acre, depending upon the degree of control required and the efficiency of gas confinement; (4) points of application not more than 18 in. apart; and (5) efficient confinement of the gas in the soil by means of a cover of gas-impervious material.—(*Courtesy Biol. Abs.*)

The confinement of chloropicrin and other gases for fumigation purposes, G. H. Godfrey (*Phytopathology, 24 (1934), No. 12, pp. 1366–1373, fig. 1*).—In connection with tests of materials for soil fumigation against the root knot nematode at the Hawaiian Pineapple Experiment Station, volatile chemicals were inserted into Petri dishes previously sealed with paper covers that had been coated with various materials. Loss in weight was recorded from time to time to determine the rate at which these materials were dissipated through them. Paper alone proved wholly inefficient. Chloropicrin was efficiently confined by coatings of animal glue, gelatine, casein glue, starch paste, and cellulose acetate. Water glass was efficient until it checked in the sun. Oil paints and varnishes proved to be very poor. Tar paper was inefficient. Casein glue effectively confined even the extremely volatile carbon bisulfide. Animal glues were found inexpensive and practical when used in tests for soil fumigation against nematodes and for grain fumigation against weevils and moths.

Foot rot of cereals [trans. title], A. J. P. Oort (*Landbouwk. Tijdschr. [Amsterdam], 45 (1933), No. 554, pp. 945–953*).—The symptoms of the take-all disease (*Ophiobolus graminis*) are fully described and compared with those of the eyespot disease (*Cercosporella herpotrichoides*). As control measures for both diseases, rotation of the crop and late sowing are recommended, although neither measure is conclusive.

Treat seed grain, A. G. Johnson, R. J. Haskell, and R. W. Leukel (*U. S. Dept. Agr., Misc. Pub. 219 (1934), pp. 4*).—This leaflet is intended to instruct the grower and seed dealer in the proper use of copper carbonate dust treatment, ethyl mercury phosphate dust treatment (Improved Ceresan), and formalde-

hyde dust, spray, dip, and sprinkle treatments for the grain smuts controllable by chemical treatment and for barley stripe disease.

Diseases of cereals.—III, The covered smut of barley, R. M. Nattrass (*Cyprus Agr. Jour., 29 (1934), No. 3, pp. 76–78, fig. 1*).—Dusting sulfur applied at the rate of about 3.5 oz. to the bushel of barley in a revolving drum successfully prevented the disease.

The dry disinfection of oat seed, D. G. O'Brien and R. W. G. Dennis (*Highland and Agr. Soc. Scot. Trans., 5 ser., 46 (1934), pp. 91–112, figs. 8*).—Dry disinfection of oat seed against leaf stripe (*Helminthosporium avenae*) has developed rapidly in Scotland. This disease, carried over winter on the seed coat, was found to result in primary lesions on the first four seedling leaves and in the death of tillers. A high percentage of infected plants also die from preemergence blight. Low temperatures during germination favor the disease. The secondary phase appears on upper leaves in August and results in infection of grain. Seed from wet districts showed heavier infection than that from dry regions. Numerous strains of the fungus were found to exist which showed differences in the degree of pathogenicity to oats in artificial inoculation tests.

Experiments indicated that soil infection does not occur. Seed disinfection with dry organic mercurial preparations was found to about double the number of seedlings established owing to elimination of preemergence blight.—(*Courtesy Biol. Abs.*)

"Purple patch" of wheat and oats: A disease caused by the fungus Rhizoctonia solani, H. J. Hynes (*Agr. Gaz. N. S. Wales, 44 (1933), No. 12, pp. 879–883, figs. 4*).—Purple patch is a new type of root injury to wheat and oats confined to a section of the southwestern slopes of New South Wales. It appears within 3 mo. of sowing as unhealthy patches of irregular shape and variable size. Individual affected plants appear stunted, stiff, and erect, with pronounced yellowing and purpling of the lower leaves, and have extensive brownish, discolored, and rotted areas on both primary and secondary roots. Infected plants may succumb, or continue to make poor growth, or at times may partially recover in the spring months. The disease is more serious on stubble than on fallow.

Preliminary experiments with fertilizers indicated beneficial results, especially with oats, from the application of sulfate of ammonia and/or lime.

Inoculation tests proved that *R. solani* isolated from affected wheat and oats was capable of reproducing typical purple patch symptoms on wheat and oats and of attacking barley and rye with severity. The occurrence of the disease on black oats is reported. Not only was the strain of *Rhizoctonia* causing purple patch similar to that causing black scurf on the potato, but tests proved that each was able to cause the same severe effects on potato shoots or cereals.

Leaf smut of rice in the United States, E. C. Tullis (*Phytopathology, 24 (1934), No. 12, p. 1386*).—*Entyloma oryzae* has been found to occur on rice in Arkansas, Louisiana, and Texas.—(*Courtesy Biol. Abs.*)

Trichoderma sheath spot of rice, E. C. Tullis (*Phytopathology, 24 (1934), No. 12, pp. 1374–1377, figs. 2*).—A sheath spot of rice caused by a fungus tentatively designated as *T. lignorum* was found in Louisiana, Texas, and Arkansas. The lesions, which are cream-colored in the center, with an irregular reddish brown border, appear about mid-July and continue to develop throughout the growing season. Vintula, Carolina Gold, C. I. 2971, Fortuna, Rexoro, and Blue Rose were found susceptible, while the short-grain varieties were more resistant.—(*Courtesy Biol. Abs.*)

Field practices affecting the control of cotton root knot in Arizona, C. J. King and C. Hope (*U. S. Dept. Agr. Circ. 337 (1934), pp. 14, figs. 8*).—

The root knot disease caused by the nematode *Heterodera marioni* is reported as responsible for heavy damages to the irrigated cotton crop in certain light soil areas in Arizona, affecting attacked plants of the Pima Egyptian type of cotton more severely than it does infected upland varieties. It causes a reduction in stands, stunting of the plants, suppression of fruiting branches, defoliation, and often death. Rotation every 2 or 3 yr. with alfalfa was found effective in maintaining satisfactory yields of Pima cotton, but was not effective in the eradication of the nematodes. Clean fallow maintained for 2 yr. by frequent cultivations or by a covering of mulch paper was effective in controlling the disease in the absence of irrigation, and the results indicated that under the dry, hot conditions prevailing in Arizona, a more prolonged period of fallow might terminate in eradication. Evidence was obtained that early irrigation reduced the severity of the disease in Pima cotton.

An Alternaria blight of the linseed plant, P. K. DEY (*Indian Jour. Agr. Sci., 3 (1933), No. 5, pp. 881–896, pls. 2, fig. 1*).—A blight and dying of *Linum usitatissimum* was observed to be most severe and characteristic in the United Provinces, India, under conditions of excess moisture in soil and atmosphere. It was not so destructive on well-drained lands. Dark spots appeared upon young leaves, bases of the calyx, and pedicel, associated with blackening and death of the pistil.

The causal organism, designated as *A. lini* n. sp., is described as having dark olive, catenulate, clavate spores, 10μ–40μ by 5μ–10μ, including the beak cell, with longitudinal septa common, constricted at transverse septa, and echinulate except for the short, tapering beak cell, which measures 3μ–7μ in length. The spore base is obtuse. The germinal tubes from the spores broke through the epidermis of young parts by pressure. Infections could not be made upon old or nearly matured parts.

Histological characters of flax roots in relation to resistance to wilt and root rot, L. W. BOYLE (*U. S. Dept. Agr., Tech. Bul. 458 (1934), pp. 19, pls. 4*).—The flax varieties Bison, Morye, and Pehanjo, which are highly resistant to the complex of soil fungi parasitic on flax at Fargo, N. Dak., Ottawa White Flower, which is a partially resistant variety, and Common, which is a very susceptible selection from commercial seed, all pure-line selections, were chosen for these studies from a large number of varieties growing in old, badly infested flax soil. Root specimens were collected from the field at from 6- to 9-day intervals for 65 days after the seed had been planted (May 21) in moderately infested soil. Other specimens were taken from plants grown during the winter under controlled conditions in the greenhouse at 16°, 20°, and 24° C., respectively. Sections were then cut from the upper 2 in. of the root systems, treated in various ways, and examined microscopically. The roots from the greenhouse-grown lots were found to differ considerably histologically from those of field-grown plants.

No observations were made on how the fungi involved gained entrance into the flax roots. Twenty days after seeding, the vascular tissues of the field-grown susceptible plants were found well filled with hyphae. None, however, were observed in the vascular tissues in the roots of comparable resistant plants, but mats of nonpenetrating hyphae were noted on the surface in some cases, while in others the hyphae were found in and between the cortical cells.

It was found that, in general, more of the roots from plants of the disease-resistant strains grown in the greenhouse resisted cortical maceration by ammonium oxalate than those from susceptible plants. In general, also, the cortical cell walls of the roots of a greater number of plants of disease-resistant strains grown in the field showed resistance to hydrolysis by sulfuric acid than was true in the case of susceptible strains. This difference, noticeable at 20 days of age, tended gradually to disappear as the plants grew

older. Furthermore, many plants of the susceptible strains showed fully as great resistance to this acid hydrolysis of the cortical cell walls as did many plants of the resistant strains. No other significant difference was found. None was noted in the response to root wounding or to rupture of the cortex by secondary roots between resistant and susceptible strains either outdoors or in the greenhouse. Neither was there any correlation found between the deposition of suberin and ligninlike materials on or in the cortical cell walls of the plant roots and resistance to infections.

In the variety Ottawa White Flower, there was evidence that resistance to wilt (*Fusarium lini*) occurs without resistance to root rot caused by other fungi.

The work was cooperative with the North Dakota Experiment Station and the University of Wisconsin.

The question of immunity among representatives of the genus Nicotiana [trans. title], M. F. TERNOVSKY (*Züchter, 6 (1934), No. 6, pp. 140–144*).—In 1932 and 1933 tests were conducted on the relative susceptibility to powdery mildew (*Erysiphe cichoracearum nicotianae*) in Crimea. Eighteen forms of *N. tabacum*, 7 forms of *N. rustica*, 18 wild and ornamental species, and 8 hybrids were tested in the greenhouse and in the field. All forms of *N. tabacum* were attacked. Three forms of *N. rustica* (*scabra*, *humilis*, and *erbasanta*) remained free from attack. Several wild and ornamental forms proved immune. Some of the hybrids (*N. glutinosa* × *N. tabacum*, *N. tabacum* × *N. sanderae*, and *N. rustica* × *N. tabacum*) escaped attack.

Thirty varieties of *Nicotiana* were tested in 1930–31 for resistance to attack by *Orobanche ramosa*, the broomrape. All proved more or less susceptible.

Physiological spotting of pea seed, W. J. ZAUMEYER and B. L. WADE (*Phytopathology, 24 (1934), No. 12, pp. 1383, 1384, fig. 1*).—A dark green to black, apparently nonparasitic, spotting of the seeds is reported on peas (*Pisum sativum*) grown in various parts of the United States, but only in the Surprise variety and its crosses and closely related types. The pods were normal. Not all of the pods on a plant were found to produce spotted seeds, nor all of the spotted seeds to produce spotted progeny. Germination was normal.

Internal breakdown of pea seed, B. L. WADE and W. J. ZAUMEYER (*Phytopathology, 24 (1934), No. 12, pp. 1384–1386, fig. 1*).—Seed of Laxtonian peas (*Pisum sativum*) from Salinas, Calif., showed irregular brown lesions from 1 to 5 mm in diameter, in the center of the seed similar to those described by H. L. G. de Bruijn, in the Netherlands, as associated with marsh areas in the field. The internally discolored seeds germinated as well as normal seeds. Attempted isolations revealed no suspected pathogen. Water in excess had been applied to the field during ripening.

Peronospora viciae and internal proliferation in pea pods, W. C. SNYDER (*Phytopathology, 24 (1934), No. 12, pp. 1358–1365, fig. 1*).—From the University of California it is reported that during certain periods pods of market peas (*Pisum sativum*), grown in coastal areas of California, sometimes show high percentages of oosporic lesions unattended by appreciable amounts of foliage infection of downy mildew. Externally inconspicuous, yellowish blotches are formed. The fungus may remain confined within the pod wall tissues, in which case it is frequently attended, internally, by a felty proliferation of the epithelial lining, beneath which the oospores lie embedded, or it may enter the pod cavity and spread over the inner surface as a mealy layer of mycelium and oospores, in which case the internal intumescences may or may not accompany the fungus.

Incubation of the diseased pods under various conditions failed to bring about conidial sporulation. Attempts to infect living pods by direct inoculation with oospores and mycelium failed. The conidial stage of *P. viciae* was obtained, however, by growing plants in soil artificially infested with oospores from diseased pods. With conidia thus produced on the stem bases or all over systemically infected seedlings, abundant infection of healthy plants was obtained yielding both the common downy mildew sporulation on the foliage, the yellowish blotches on the pods, and oospores in the tissues of both diseased foliage and pods.—(*Courtesy Biol. Abs.*)

Premature dying and softening of potatoes in the seasons of 1932 and 1933 [trans. title], V. Vielwerth (*Ochrana Rostlin, 13 (1933), No. 5+6, pp. 176–185, figs. 3*).—In eastern Czechoslovakia in 1932 and 1933 potatoes showed premature dying of the leaves and softening of the tubers in the soil, resulting in losses as high as 90 percent, the late sorts being attacked most and the early ones least. Abnormal soil moisture deficiency extending from 1931 to 1933 is held to have stopped the development of the plants prematurely so that the tubers could not ripen normally but became soft and rubbery, of a gray-black color within, and quickly decayed or shriveled into a dry, hard mass.

The author discusses means to be taken to reduce the danger of such drought damage in the future.

The canker and the dry rot diseases of swedes, W. Buddin (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 74 (1934), pp. V+47, pls. 8*).—A stem canker of swede seed plants, as well as a dry rot of the swede root crop, was found in England to be caused by *Phoma lingam*. Leaf and pod lesions were also produced, and the seeds in infected pods were penetrated. No evidence was found of insect dissemination. In commercial stocks of swede seed the degree of seed infection rarely exceeded 0.2 percent. More important sources of infection were cruciferous weeds, notably *Brassica alba*, and debris of a previously diseased crop.

In pure culture different isolates revealed considerable variation in characteristics.

Seed disinfection was not wholly successful without causing serious loss of vitality of the seed. Proper attention to plant sanitation is regarded as the most important means of control.

Seasonal notes on tobacco diseases.—VII, Spraying in seed-beds and lands, J. C. F. Hopkins (*Rhodesia Agr. Jour., 31 (1934), No. 10, pp. 727–734*).—Notes are given on successful seedbed spraying with bordeaux mixture against angular spot, wildfire, and frogeye at the Tobacco Research Station, Salisbury. Practical recommendations are made.

Dissemination of angular leaf spot of tobacco by the southern tobacco worm, E. M. Johnson (*Phytopathology, 24 (1934), No. 12, pp. 1381–1383, fig. 1*).—From the Kentucky Experiment Station it is reported, and evidence is given, that *Bacterium angulatum* may be spread from leaf to leaf and from plant to plant of tobacco by the larvae of the southern tobacco moth (*Phlegethontius sexta*).

On the vaccination of the tobacco plant against Thielaviopsis basicola, C. Arnaudi (*Bul. Torrey Bot. Club, 60 (1933), No. 8, pp. 583–597, figs. 4*).—The first practical application of vaccination of plants, according to the author, was demonstrated in the work here described, in which tobacco was vaccinated against *T. basicola*. This host was used because of its economic importance and ease of handling, and the fungus was selected because it was easily cultured artificially and was productive of abundant mycelium. In the described vaccination tests, liquid suspensions or dried preparations of the fungus were applied to the soil at planting time or after the seeds had germinated.

The most favorable dose to impart acquired immunity had to be determined for each tobacco variety. Too small doses were found insufficient, while excessive doses sometimes proved injurious to the plants. The time of soil treatment varied from 6 to 12 days or more before the active inoculum was applied. The increased resistance of vaccinated plants is shown in photographic illustrations. The duration of acquired immunity appeared to be about 2 mo. under the conditions of the experiment.

Phytophthora megasperma Drechsler in Tasmania, W. J. DOWSON (*Brit. Mycol. Soc. Trans., 19 (1934), pt. 1, pp. 89, 90*).—Extensive damage to carrots shipped from the northwest coast of Tasmania in the abnormally wet season of 1931 was found due to *P. megasperma*.

Comparison of yellows resistant kraut cabbage varieties in 1932, J. C. WALKER (*Canner, 76 (1933), No. 11, II, pp. 41, 42*).—This contribution from the Wisconsin Experiment Station reports, in tabular form, the high relative resistance to yellows of the resistant varieties All Head Select, Marion Market, Globe, and Wisconsin All Seasons in comparison with five susceptible varieties, and for these resistant varieties gives the comparative rate of maturity and the percentage of bursted heads appearing from 55 to 95 days after transplanting as determined by field tests.

Alternaria brassicae as a parasite of Chinese cabbage, W. H. DAVIS (*Phytopathology, 24 (1934), No. 12, pp. 1379, 1380*).—From the Massachusetts State College *A. brassicae* is reported as seriously parasitizing *Brassica pe-tsai*. The spore measurements and characteristics of the fungus obtained from this host are given. Cross inoculation to common cabbage and cauliflower was successful, but not to horseradish, turnip, collards, mustard, and brussels sprouts.

Tomato diseases and insect pests: Identification and control, K. J. KADOW and L. H. SHROPSHIRE (*Illinois Sta. Circ. 428 (1935), pp. 36, figs. 13*).—This discusses, for the benefit of the grower, general control measures, including the selection of disease-free seed, seed treatment, clean soil, clean hands, seed dusting, field sanitation, and crop rotation. It then describes the following important tomato diseases occurring in Illinois and gives detailed recommendations for control: Mosaic (virus), streak (virus), bacterial canker (*Aplanobacter michiganense*), *Fusarium* wilt (*F. lycopersici*), *Septoria* leaf spot (*S. lycopersici*), *Verticillium* wilt (*V. alboatrum*), bacterial spot (*Bacterium vesicatorium*), blossom-end rot (physiological), damping-off (various fungi), leaf mold (*Cladosporium fulvum*), hollow stem (physiological), and collar rot (*V. lycopersici, Macrosporium solani, Rhizoctonia solani,* and *Phytophthora cryptogea*).

Soil sterilization methods by means of steam, hot water, and formaldehyde are discussed, and directions are given for preparing bordeaux mixture, bordeaux dust with lead arsenate, nicotine dust, and poison bran bait.

The section on insect pests is abstracted on page 73.

The honeybee in relation to the overwintering and primary spread of the fire-blight organism, A. L. PIERSTORFF and H. LAMB (*Phytopathology, 24 (1934), No. 12, pp. 1347–1357*).—From the Ohio State University it is reported that when beehives that had been infested with virulent cultures of *Bacillus amylovorus* were placed under apple trees enclosed within cheesecloth cages, the bees did not carry blight inoculum from the hives to the blossoms. Colonies that had been confined to trees badly infected with blossom blight did not spread the fire blight organism when transferred to another locality.

The longevity of the organism in pure honey, either in vitro or in the comb, was found to vary from 5 to 11 days after introduction. The organism

could not be demonstrated on combs, frames, or in the honey in a beehive 24 hr. after infestation with a virulent suspension. It was recovered from heads of honeybees that had been taken from an infested hive for 2 days, but not thereafter.

It is concluded that the beehive is not a probable source of fire blight inoculum in the spring under Ohio conditions.

Fire blight of pears and related plants, H. E. THOMAS and P. A. ARK (*California Sta. Bul. 586 (1934), pp. 43, figs. 7*).—New facts brought out by investigations conducted in California since 1930 are assembled, with previously acquired information about the disease caused by *Bacillus amylovorus* (*Erwinia amylovora*).

Of 193 species of the Rosaceae tested, 123 are listed as susceptible to fire blight, 34 being reported for the first time. Overwintering of the bacteria is recorded for 42 species, all belonging to the Pomoideae. The symptoms of the disease are described and distinguished from those of bacterial pear blast.

The manner of dissemination and the different insect species which may be involved are discussed. Holdover cankers within the orchard were found to be the chief sources of spring infection. No infection resulted when beehives contaminated from inoculated blossoms were enclosed with blossoming pear trees.

Evidence is presented showing that high air humidity with or without rain is important in the establishment and development of blossom infection after the organism has been introduced, apparently due to its influence on the quantity and sugar content of the nectar. The bacteria in blighted apple and pear tissues were found to be able to survive air temperatures above any which prevail in California orchards, which sometimes reach from 115° to 120° F. in the warmer valleys.

Because of the demonstrated survival of the bacteria for a time in the soil and since the opportunity exists for blight bacteria to be washed by irrigation water into root wounds, experiments were conducted which showed that wounds made in pear roots were closed within 3 days to invasion by the blight bacteria.

A thorough discussion of control practices from the standpoint of California conditions includes reference to the orchard site and choice of varieties, with brief reference to the work conducted at the Southern Oregon Substation, as well as recent work begun in California, looking toward the ultimate selection and development of resistant varieties. The use of bordeaux mixture sprayed into the open blossoms, although reported to have given marked reduction in blossom blight in the hands of a few growers, is still considered in the experimental state. The avoidance of cultural operations favorable to the progress of fire blight is held advisable only as a supplement in some cases to more direct methods of control. It is recommended, however, that, whenever feasible, land be prepared for irrigation at least 3 days before water is turned into the orchard. The authors describe the treatment of blight cankers by the scraping method (excision of all invaded bark tissues), the scarifying method (removal of outer bark only), and the drenching method (application of a chemical solution which penetrates the uncut surface of blight-invaded bark).

Directions for preparing the zinc chloride solutions developed by L. H. Day[1] for the drenching method are given. Cadmium sulfate, sodium salicylate, and cobalt nitrate did not prove superior to zinc chloride, but continued search for improved materials is held desirable, since the authors consider that the drenching method will probably eventually replace other methods of direct blight treatment.

[1] Calif. Agr. Col. Ext. Circ. 45 (1930), pp. 1–13.

For the benefit of growers, a seasonal program for fire blight control, beginning with the elimination of holdover cankers and continuing through the season, is outlined and discussed. The necessity for frequent inspections throughout the blossoming period and immediately afterward, with skillful removal or treatment of all infections, is brought out. Careful disinfection of tools and wounds by a mercuric chloride-mercuric cyanide disinfectant (1 part of each in 500 parts by weight of 10 percent aqueous glycerin solution) is advised.

Storage scab on apples and its control [trans. title], G. ROTHE (*Mitt. Deut. Landw. Gesell., 48 (1933), No. 35, p. 775*).—An August spray of lime-sulfur or copper-lime is recommended for apples.

Peach mosaic, D. CATION (*Phytopathology, 24 (1934), No. 12, pp. 1380, 1381*).—From the Michigan Experiment Station it is reported that a young Hale peach tree budded in the summer of 1932 from a specimen of a diseased peach tree from Grand Junction, Colo., developed crinkling and mottling the next spring. The symptoms resembled those of peach mosaic reported from Texas by L. M. Hutchins. They appeared only on foliage developed under cool conditions. The disease was retransmitted to peach seedlings by budding from the Hale tree, and the dependence of symptoms on low temperatures was again disclosed.

The susceptibility of the peach to artificial inoculations with Bacterium syringae and some allied organisms, J. C. DUNEGAN (*Phytopathology, 24 (1934), No. 12, pp. 1378, 1379*).—The peach (*Prunus persica*) was found to be susceptible to *B. syringae*, *B. prunicola*, *B. mors-prunorum*, *B. papulans*, and bacteria isolated from apple target canker and from Italian prune leaf spots when aqueous suspensions of the organisms were forced into the tissues of the leaves and twigs. A chlorotic area with purple margins developed in the vicinity of the site of the inoculation, indicating a marked effect on the chloroplasts and upon anthocyanin pigment formation which did not occur when sterile water or cultures of *B. pruni* were introduced in the same way.

Plum pox: A new virus disease, D. ATANASOV (ATANASOFF) (*God. Sofiisk. Univ., Agron. Lesov. Fakult. (Ann. Univ. Sofia, Facult. Agron. et Sylvic.), 11 (1932–33), pp. 49–70, figs. 6; Eng. abs., pp. 68, 69*).—This plum disease, characterized by the premature ripening and dropping of the fruit, was first noticed at the end of the World War in Keustendil, southwestern Bulgaria, gradually spread over all western Bulgaria along the Yugoslav border and east to Plovdiv (Philippopolis) in southern Bulgaria, but does not occur in the extensive plum-growing region of north Bulgaria. It is very destructive, as the affected trees never yield marketable fruit. It closely resembles the buckskin of cherry, described from California, which has been seen on cherry trees in Sofiya.

The leaves of infected trees have characteristic light green or yellowish-green spots, blotches, streaks, arches, or complete rings. The fruit is set and develops normally, then ripens from 10 to 15 days ahead of fruit on normal trees. In this the disease resembles peach yellows. Blue spots appear on the surface of the fruit. These become gradually depressed, and the fruit appears pox marked. Under the spots the tissues are necrotic, rusty, dry, and shrunken, or they may be normal, but having a red to purple color. The necrotic tissues extend down to the pit. Pockets filled with gum are often formed in these tissues. The diseased fruit is low in sugar, has an unpleasant taste, and shrivels up and falls prematurely. Affected trees degenerate slowly, the smaller branches and annual shoots begin to die gradually, and the tree has a sickly appearance.

Judging from published descriptions, the author thinks that this disease has been seen already in Kentucky, Minnesota, Illinois, the Netherlands, and

Czechoslovakia, and that it may be identical with the trouble described by W. M. Carne in Australia and by B. J. Dippenaar in South Africa.

Plum pox was easily transmitted to healthy trees by budding. It was observed on six plum varieties, but mostly on native Keustendil plum (*Prunus domestica*), which represents more than 98 percent of all Bulgarian prune orchards. As a control measure, the eradication of diseased trees is recommended.

Prunes in Bulgaria are reported to be attacked by another virus disease, different from pox, which does not affect the fruit. An affected leaf is figured.

Cranberry fruit rots in New Jersey, R. B. Wilcox (*New Jersey Stas. Circ. 340 (1935), pp. 4*).—This is a popular discussion of the causes and control measures recommended for the control of cranberry fruit rots in New Jersey, including early rot (*Guignardia vaccinii*), blotch rot (*Acanthorhyncus vaccinii*), bitter rot (*Glomerella rufomaculans vaccinii*), and end rot (*Godronia cassandrae*). Bordeaux mixture 4-4-50, with 1 lb. of rosin-fish oil soap is recommended as a spray, not less than five applications being required where rot has become severe, the first when the earliest flower buds reach the pink or "dangle" stage, with repetitions, at intervals not exceeding 2 weeks, until early August. The flooding of a bog during the growing season is advised against whenever possible.

Immunity of Viking, a Norwegian red currant, to Cronartium ribicola and C. occidentale under greenhouse conditions, G. G. Hahn (*U. S. Dept. Agr. Circ. 330 (1935), pp. 16, pl. 1, figs. 2*).—No species of *Ribes*, including the group of red and white garden currant varieties, has hitherto been unquestionably proved immune to white pine blister rust (*C. ribicola*). A red currant variety from Norway, however, when tested artificially in the greenhouse (1929-32) with Scottish and American strains of white pine blister rust, was found to be immune. This variety, apparently an *R. petraeum* hybrid, is described for the first time and is given the new name Viking ("Rød Hollandsk Druerips"). It was found to be immune also to the closely related piñon blister rust *C. occidentale*. The Viking, a horticulturally desirable plant, has been cultivated for many years in Norway, where it has not been observed to become infected with Norwegian strains of blister rust.

The leaf characters of the Viking are compared with those of susceptible varieties.

The fight against oidium [trans. title], T. Ferraris (*Prog. Agr. y Pecuario, 40 (1934), No. 1830, pp. 417-422, fig. 1*).—The author discusses the value of sulfur, potassium permanganate, solutions of the latter, the alkaline polysulfides, bordeaux-sulfur mixtures, sulfurous acid, bisulfites, hyposulfites, etc., as materials for the control of the powdery mildew of the vine. In his opinion, sulfur has many advantages over the rest under ordinary circumstances.

A preliminary report on zinc sulphate as a corrective for bronzing of tung trees, H. Mowry and A. F. Camp (*Florida Sta. Bul. 273 (1934), pp. 34, figs. 7*).—After a description of the symptoms and effects of the unthrifty condition of tung trees (*Aleurites fordi*) known in Florida as "bronzing", the results of experiments begun in 1931 for the correction of the trouble are reported.

This wide-spread disorder, apparently due to zinc deficiency, failed to respond to the use of common fertilizer elements, cultivation practices, or cover cropping. It occurs on a wide variety of soils which often, but not always, contain large amounts of phosphatic salts. The leaves are bronzed. The new leaves become successively smaller, often badly malformed and bunched. Affected trees are predisposed to cold weather damage, develop abnormally slender shoots the next season, and often push out adventitious buds from the

older wood. In severe cases twigs and buds die, and the tree may succumb. The trouble may develop in young nursery stock or may not begin to appear until several years after planting.

In 3-yr. tests on the effects of various chemicals, only zinc sulfate caused recovery. It did so whether applied to the soil, alone or combined with commercial fertilizer, or applied as a spray combined with lime. Since tung trees are not sprayed for pest control, soil applications of zinc sulfate are advised. It is held that until further evidence is obtained as to the effects of zinc accumulation growers should apply the material in repeated small applications, no more than is required to maintain trees in health. A general application in April, followed by another in June, for trees which show bronzing, is suggested, the zinc sulfate to be applied at the rate of from 0.25 to 0.5 lb. per tree for trees under 8 yr. of age.

In plantings adjacent to one that showed bronzing in tung trees, Satsuma oranges showed frenching (chlorosis), pecans showed rosette, corn showed the "white bud" condition, and all responded to zinc treatment. Seedlings of mu oil trees (*A. montana*) showed chlorosis, retarded growth, and winterkilling, but responded promptly to zinc sulfate soil applications.

Walnut blight and its control in the Pacific Northwest, P. W. MILLER (*U. S. Dept. Agr. Circ. 331 (1934), pp. 14, figs. 8*).—The conclusions are popularly presented of 5 yr. of study of the life history and control of walnut blight (bacteriosis) caused by *Phytomonas* (*Pseudomonas* or *Bacterium*) *juglandis* (E. S. R., 71, p. 805). The author holds that (1) the causal organism overwinters, under Oregon conditions, primarily in diseased buds and to a lesser extent in lesions on twigs of the previous year's growth; (2) that rain water is the most important, if not the sole, agency concerned in the spread of primary and secondary infections; and (3) that the timely use of bordeaux mixture 2–2–50 is an effective means of control. At least two treatments of bordeaux mixture applied (1) just before the stigmas are fully expanded and (2) immediately at the close of pistillate bloom, when the nuts are about the size of peas, appear to be necessary for the best results under western Oregon conditions.

Under some circumstances, spray burn follows the application of bordeaux mixture to walnut leaves that are reddish in color and not full grown. Studies carried on in 1934 indicate that the use of a summer oil emulsion or a light, neutral, spray oil in the proportion of 1 gal. of oil to 100 gal. of spray mixture will reduce the leaf burn appreciably without destroying the effectiveness of the spray. All dusts used in control studies, including copper-lime dust, bordeaux-lime dust, three types of flotation sulfur dusts, and a proprietary gas-house colloidal dusting sulfur, failed to give satisfactory control.

Black-spot and powdery mildew in the Middle West and South, H. R. ROSEN (*Amer. Rose Ann., 1934, pp. 118–120*).—This contribution from the Arkansas Experiment Station discusses the promising results secured in 2-yr. tests with a pine-tar distillate to which was added copper resinate, conducted in a section of the country where climatic conditions prevail which make safe and satisfactory control of black spot and powdery mildew of roses difficult to obtain with ordinary materials, especially on Hybrid Teas.

The beech bark disease: A Nectria disease of Fagus following Cryptococcus fagi (Baer.), J. EHRLICH (*Canad. Jour. Res., 10 (1934), Spec. No., pp. 593–692, pls. 9, figs. 19; also Arnold Arboretum Contrib., No. 7 (1934), pp. 104, pls. 9, figs. 19*).—This disease of American and European beech (*F. grandifolia* and *F. sylvatica*) has made rapid and destructive spread in Nova Scotia, New Brunswick, and Cape Breton since it was first noted about 1920 near Halifax. It has been reported also from Maine. A survey by the author in

the Maritime Provinces showed that about 90 percent of the beeches had been attacked in typical affected areas, approximately 50 percent having already died where the disease had been present for a considerable period. Mortality was found to increase with the size of the trees and was correlated definitely with diameter, crown class, and slope position. The author believes that the disease is assuming the proportions of a fatal and spreading epiphytotic in America.

Investigation showed the disease to be the result of attack by an apparently distinct variety of the fungus *N. coccinea* upon bark previously injured by the feeding of the woolly scale insect, *C. fagi*. The fungus and the insect are described and illustrated. The scale occurs in various parts of Europe and in eastern North America as far south as the Massachusetts Bay region. In Massachusetts, however, the insect is not known to be accompanied by the *Nectria* and the resulting damage is not present.

Following the presence of the scale insect, the disease becomes evident on the bark of trunk and branches and can be recognized by the development of the conidial (*Cylindrocarpon*) sporodochia of the fungus and later by its clusters of red perithecia. It was found that the continued advance of the mycelium leads to an extended zone of necrotic tissue, which in time includes and kills the cambium. The multiplication of infections and enlargement of the lesions often lead to the dying of large areas of bark, which become cracked and frequently loosen and scale off from the wood in great sheets. The most heavily attacked trees soon die after showing, in the earlier stages, symptoms of moisture deficiency in the crown of the tree followed by the drying up of foliage and death of small branches. Inoculation experiments demonstrated the inability of the fungus to attack, except where the scale insects had previously injured the bark. Sometimes, especially on younger trees and in exposed situations, lesions did not enlarge but remained as deeply depressed cavities surrounded by callus.

When trees attacked by scale were subjected within a year after infestation to treatment for the control of the insect, fungal infection generally did not follow. A proprietary oil and kerosene-soap emulsion proved satisfactory for use on valuable shade trees, but the control of the disease in the forest was not attempted.

The author suggests the possible usefulness of biologic control of the insect. Prompt cutting of diseased and dead trees and the substitution of a younger, less susceptible, stand through forest management are also presented as a means of minimizing the activities of the disease.

The Dutch elm disease in Bulgaria, D. ATANASOV (ATANASOFF) and S. MARTINOV (MARTINOFF) (*God. Sofiisk. Univ., Agron. Lesov. Fakult. (Ann. Univ. Sofia, Facult. Agron. et Sylvic.), 11 (1932–33), pp. 71–86, figs. 4; Eng. abs., p. 83*).—The Dutch elm disease is reported to have reached Bulgaria a few years before, to be quite generally in the Sofiya parks, and to have been seen at various places along the Yugoslav border and at two places in the central part of north Bulgaria.

A description is given of the disease, of the causative organism (*Graphium ulmi*), and of control methods. The authors confirm the observations of others regarding the occurrence of coremia and spores of the fungus in the galleries of the elm bark beetles (*Scolytus scolytus* and *S. multistriatus*) and the occurrence of small galleries around the bases of the young shoots in which the elm bark beetles deposit the infection material.

The causes of the dying of oaks in the Schipoff forest [trans. title], A. I. STRATONOVICH (A. J. STRATONOWITSCH) and E. P. ZABOROVSKIĬ (SABOROWSKIJ) (*Trudy Issledov. Lesnomu Khoz. Lesnoĭ Promysh. (Mitt. Staatsinst. Wiss.*

Forsch. Geb. Forstw. u. Holzindus.), *No. 9* (*1931*), *pp. 87, figs. 35; Ger. abs., pp. 86, 87*).—This is a report of investigations conducted in 1929 and 1930 to determine the cause of an extensive dying of oaks, which began in 1928, in the Schipoff forest in the central black-earth region of the U. S. S. R. Environmental conditions are not very favorable for the oak in this region because of drought, late and early frosts, and severe winter cold. The mature stands were chiefly affected. Suppressed stands suffered severely. Sprouts and saplings were badly troubled. The dying started in the tops and progressed downward, the roots succumbing last.

As a result of the studies, it is concluded that the oaks succumbed to a series of devitalizing experiences beginning with a period of dry years stretching from 1920 to 1928, accompanied by extensive defoliation by leaf-eating caterpillars in 1926 and 1927 and by an attack of oak mildew (*Microsphaera alphitoides*) in 1927, followed by an early frost which injured the nonwoody growth. The devitalized trees then suffered secondary damage from twig girdlers, borers, and *Armillaria mellea*, from which they did not recover.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of work with economic insects and mammals by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 93, 94, 100–112*).—The work of the biennium reported (E. S. R., 69, p. 232) relates to apiculture, particularly with relation to nectar secretion in plants and meteorological conditions which affect such secretion, by R. L. Parker; insect light traps, insect reactions to soil and plant temperatures, and bacterial and fungus diseases of grasshoppers, all by R. C. Smith; distribution and biology of the hessian fly, life history of the wheat straw-worm, control of chinch bugs and the green bug, and *Calendra* sp. in wheat, all by R. H. Painter and H. R. Bryson; corn ear worm infestation in corn and the testing of various sprays and dusts as insecticides or repellents against it, biological studies of the corn leaf aphid, corn root worm investigations, the influence of cultural measures on subterranean insect injury to corn, and chinch bug investigations, all by D. A. Wilbur and Bryson; western apple curculio parasites (E. S. R., 72, p. 512), cankerworms, and codling moth control, all by Parker; wireworms and other insect enemies of the roots of staple crops, by Bryson; alfalfa, vetch, and clover insects and insect pests of grass and allied plants, both by Smith and Wilbur; biology and control of the western apple curculio (*Tachypterellus quadrigibbus magnus* List), by Parker; resistance of sorghums, wheat, and corn to insect attack, by Painter and J. H. Parker; and reproduction and hibernation in mammals, both by G. E. Johnson.

The waterfowl flyways of North America, F. C. Lincoln (*U. S. Dept. Agr. Circ. 342* (*1935*), *pp. 12, figs. 4*).—Studies of migration by the banding method have led to the recognition of four different flyways followed by birds in their spring and fall migrations in the United States. Covering practically the whole country and extending northward into Canada and southward into Mexico, these flyways are readily definable by the terms Atlantic, Mississippi, Central, and Pacific, descriptions and maps of which are presented. While the strong attachment that these fowl have for their ancestral migration routes may mean an abundance in one flyway, it does not mean an increase in other flyways in succeeding seasons. Heavy overshooting throughout the country, drainage, agricultural activities, and drought in the western parts have reduced the numbers of migratory waterfowl over the entire continent, but the decrease has been much more rapid in the Central and Pacific coast areas.

A program of waterfowl restoration, J. C. Salyer II (*U. S. Dept. Agr. Circ. 339* (*1934*), *pp. 11*).—In dealing with the subject of waterfowl restoration

the author considers their hereditary nesting ground, conditions found in the summer of 1934, the restoration idea as favored by research, plans for continuous production-development of refuges, the water supply on the breeding grounds, etc.

A preliminary survey of the insect fauna of some typical Michigan trout streams, W. F. Morofsky (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 82–86*).—Contributing from the Michigan Experiment Station, the author reports upon a study made during the years 1933 and 1934 of the insect contents of more than 800 trout stomachs to determine the predominating insect forms serving as food in Michigan species of trout. The results, summarized in four tables, show that brook trout, up to a certain size, prefer May fly nymphs, and brown trout certain species of caddis fly larvae. Rainbow trout are general feeders.

Technique of field experimentation in entomology.—II, The reduction of data by the method of analysis of variance, L. L. Huber and J. P. Sleesman (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 70–76*).—In this further report of studies at the Ohio Experiment Station (E. S. R., 72, p. 500), the details of which are presented in tabular form, the authors have attempted to show that it is not extremely difficult to analyze data by the method of variance when the experiment is properly planned.

A photoelectric method for measuring small leaf areas, J. W. Bulger (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 76–81, figs. 4*).—A description is given of a method for employing a photoelectric cell to measure the areas eaten by insects from poisoned leaf sandwiches ⅞ in. in diameter. Although the results are not quite so accurate as those obtained by measuring photographic enlargements of the sandwiches with a polar planimeter, they can be obtained without the delay incident to the photographic procedure.

Plant quarantine and pest control problems common to Mexico and the United States, A. Dampf (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 131–138*).—A presentation of the subject contributed from the Mexican Plant Protective Service.

Advantages and limitations of organic insecticides, R. C. Roark (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 211–215*).—A critical review of the subject.

Further experiments on organic thiocyanates as insecticides, F. Wilcoxon and A. Hartzell (*Jour. Econ. Ent., 28 (1935), No. 1, p. 153*).—This is an abstract of further work (E. S. R., 72, p. 503) in which five closely related organic thiocyanates were synthesized and their insecticidal properties compared with that of γ-thiocyanopropyl phenyl ether, previously tested.

Of these compounds one, namely, trimethylene dithiocyanate, was definitely superior to the above-mentioned ether, while the remainder were distinctly inferior. Trimethylene dithiocyanate was considerably more toxic than its isomer propylene dithiocyanate. Trimethylene dithiocyanate gave satisfactory control in laboratory tests on the bean aphid, the melon aphid, the citrus mealybug, the long-tailed mealybug, the lesser European bark beetle *Scolytus multistriatus*, the potato flea beetle, and the common red spider. Of 75 species and varieties of plants tested with regard to their tolerance to trimethylene dithiocyanate (0.1 percent), 64 were tolerant as compared with 59 for γ-thiocyanopropyl phenyl ether used at the same concentration.

Studies on how derris kills insects, N. Tischler (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 215–220, figs. 2*).—Contributing from the New Jersey Experiment Stations upon the absorption and the physiological effects of derris, the author concludes that its toxic effect is general rather than specific to any organ or system.

New wetting agents for old insecticides, J. M. Ginsburg (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 224–228*).—Experiments conducted at the New Jersey Ex-

periment Stations with several new sulfated compounds in order to determine their possible value as spreading and wetting agents with contact insecticides, in which the apple aphid and larvae of *Culex pipiens* were employed, are reported upon. The results indicate that these chemicals spread on waxy foliage in high dilutions, possess a substantial margin of safety in toxicity to foliage, possess valuable emulsifying properties, and are compatible with hard water and sea water.

The importance of surface temperatures in heat sterilization, J. H. Pepper and A. L. Strand (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 242–244, fig. 1*).—Contributing from the Montana Experiment Station, the authors report upon the hourly temperatures above and at the surface of a concrete floor during a heat sterilization such as is employed in flour and cereal mills for the control of insect pests. Using coils of nichrome wire across a voltage of 115 and an amperage of 20 as the source, it was found that 120° F., the fatal high temperature for the confused flour beetle, was reached at the surface of the flour in 8 hr., at ¼ in. above the surface in 4 hr., and at ½ in. above in 2 hr.

Utilization of a completely refined, low-boiling petroleum distillate in controlling insects infesting chrysanthemum and other plants, J. M. Ginsburg, J. B. Schmitt, and P. Granett (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 236–242, fig. 1*).—In work at the New Jersey Experiment Stations "a completely refined low-boiling petroleum distillate, of the kerosene type, was studied in reference to its toxicity to insects and injury to plants. A large number of greenhouse plants infested with several species of insects were sprayed with the oil in pure, unemulsified form, using three different types of sprayers, delivering coarse, semicoarse, and very fine foglike sprays, respectively. Several thousand young chrysanthemum plants were not damaged even when completely immersed in the oil, while many delicate species of plants were injured by spraying. The oil gave a very high percent kill on the following insects: Red spider, thrips mealybug, scale, aphids, white fly, and tent caterpillars.

"The results in general suggest the following conclusions: (1) This oil can be safely applied either as spray or dip on chrysanthemum and may serve as a 'clean-up' spray to control heavy infestation of resistant insects on this plant. (2) Injury to foliage of other plants may be avoided or entirely eliminated by using fog sprayers. (3) In general, the finer the spray, the less danger of injuring foliage. (4) With fog spraying, the control of insects is more thorough when an extract of pyrethrum equivalent to 0.5 lb. of flowers to the gallon or more is incorporated in the oil. (5) Spraying should be done on sunny days and when the humidity is low, allowing rapid volatility of the oil from the plant tissue. (6) Spraying of blossoms and high developed flower buds should be avoided as permanent injury may result."

[Notes on economic insects and their control] (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 31, 98, 112, 130, 138, 142, 247–250*).—The notes here contributed (E. S. R., 72, p. 501) are as follows: Drained Crankcase Oil for Codling Moth Bands, by F. Sherman III (p. 31); *Haltica ignita*—Feeding on Fuchsia in the Greenhouse, by M. C. Van Horn (p. 98); *Necrophorus hybridus* Hatch and Angell in Colorado, by F. G. Meserve (p. 112); Preliminary Field Tests of Oil Bait for Cutworm Control, by J. H. Bigger (p. 130); *Ceratostomella (Graphium) ulmi*, the Cause of the Dutch Elm Disease, Transmitted by *Scolytus multistriatus*, by W. Middleton, W. D. Buchanan, C. May, and J. M. Walter (p. 138); An Easily Cleaned and Efficient Dust Mixer, by G. M. List (p. 142), contributed from the Colorado Experiment Station; A Method for Protecting Mushroom Grain Spawn against Springtails and Certain Other Mushroom Pests, by C. A. Thomas (p. 247), contributed from the Pennsylvania Experiment Station; Third Brood Chinch Bugs Observed in Illinois for the First Time, by J. H.

Bigger (p. 247); High Percentage of Parasitization of Codling Moth Eggs by *Trichogramma minutum* Riley in the Wenatchee, Washington, District, by M. A. Yothers, P. B. Allen, Jr., and P. M. Scheffer (pp. 247, 248); *Exoprosopa fasciata* Macq., White Grub Pupal Parasite, by P. O. Ritcher and C. L. Fluke, Jr. (p. 248); Control Experiments against Fuller's Rose Beetle (*Asynonychus godmani* Crotch) on Roses in Commercial Greenhouses, by H. Broudy (pp. 248, 249), contributed from the Massachusetts Experiment Station; Breeding the Hessian Fly and Its Parasites in Shell Vials, by W. T. Emery (p. 249); and Effect of Heat Treatment on Toxicity of Calcium Arsenate to Bean Foliage, by N. F. Howard and R. H. Davidson (p. 250).

[Report of work with economic insects and their control by the Alabama Station] (*Alabama Sta. Rpt. 1933, pp. 27–29*).—The work of the year briefly referred to (E. S. R., 71, p. 666) includes the life history and control of citrus insects, by L. L. English; bollweevil control with calcium arsenate, by J. M. Robinson and F. S. Arant; turnip webworm control, by Robinson; life history and control of the cowpea curculio and biology and control of the southern corn rootworm, both by Arant; fungus diseases (*Metarrhizium anisopliae* and *Sporotrichum bassiana*) of the pecan weevil, by H. S. Swingle and J. L. Seal; and the life history and control of the pecan weevil, by Swingle.

Fourteenth biennial report of the Kansas Entomological Commission for the years 1933–1934 (*Kans. Ent. Comn. Bien. Rpt., 14 (1933–34), pp. 24*).—This report deals largely with orchard survey and control work with insect pests in Kansas, the southern half of the State by B. Liston (pp. 3–7) and the northern half by R. G. Yapp (pp. 8–13). Details of apiary inspections for 1933 and 1934 are given in tabular form by R. L. Parker (pp. 14–16).

[Report of work with economic insects by the Nevada Station] (*Nevada Sta. Rpt. 1934, pp. 21, 22, 33, 34, fig. 1*).—Brief reference is made to the progress of work on the relation of methods of herding sheep on the open range to the prevalence of the sheep botfly, by S. B. Doten, C. E. Fleming, and L. R. Vawter (E. S. R., 71, p. 388), and on insects injurious to alfalfa, including the pea aphid and the alfalfa weevil and its parasite *Bathyplectes curculionis*, by Doten, S. J. Snow, and G. G. Schweis (E. S. R., 71, p. 506).

[Contributions on economic insects and their control in New Jersey] (*New Jersey Stas. Circs. 339 (1935), pp. 2; 341, pp. 4; 342, pp. 4; 343, pp. 4; 344, pp. 4; 345, pp. 4*).—These brief practical accounts relate, respectively, to The Grape Berry Moth (*Polychrosis viteana* Clemens), by B. F. Driggers; and The Elm Leaf Beetle (*Galerucella luteola* Muller), The Stalk Borer (*Papaipema nebris* Gn.), Control of Scale Insects on Nursery Stock and Ornamental Shrubs, The Cyclamen Mite and the Broad Mite, and The Chrysanthemum Midge (*Diarthronomyia hypogaea* F. Low), all by C. C. Hamilton.

[Report of work with economic insects by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 256–283, figs. 2*).—The work of the biennium with economic insects reported upon (E. S. R., 68, p. 637) includes that with the more important insect pests of 1933–34, by E. Hixson; an insect pest survey in 34 counties, the identification of two species of pecan *Phylloxera* (*P. caryaecaulis* Fitch and *P. notabilis* Perg.), and damage to livestock by bloodsucking midges (*Culicoides varipennis* Coq.), and by F. E. Whitehead; the clover leaf weevil, by G. A. Bieberdorf; the destruction of chinch bugs by deep burial, by R. G. Dahms; control of the squash bug by hand picking and bollweevil control results for 1933–34, both by Hixson; low honey production during the drought, by Bieberdorf; further work with insect and tick transmission of anaplasmosis, by C. E. Sanborn and L. H. Moe (E. S. R., 67, p. 453); and mosquito pest control in 20 counties as a Federal Control Work Project, by Sanborn.

[Report of work with economic insects by the Oregon Station] (*Oregon Sta. Bul. 334 (1934), pp. 39–42, 55, 61, 71, figs. 2*).—Brief reference is made to the work of the biennium 1933–34 (E. S. R., 64, p. 355) with blackberry mite, European earwig, codling moth and its control, prune thrips, airplane dusting for the western spotted cucumber beetle, control of the two-spotted mite and the pear leaf blister mite, and a midge outbreak largely due to *Chironomus utahensis*.

[Report of work with insects, insecticides, and insect control by the Washington Station] (*Washington Sta. Bul. 305 (1934), pp. 27, 28, 34–37, 62, 63*).—Reporting briefly upon the work of the year (E. S. R., 71, p. 217), reference is made to the use in codling moth control of zinc arsenate with herring oil, zinc arsenite, manganese arsenate, zinc sulfate-calcium arsenate-calcium hydroxide, and aluminum sulfate-calcium arsenate-calcium hydroxide, by K. Groves; the nature of the lead and arsenic residue on fruit, by J. L. St. John, Groves, and R. F. Cohee; investigations of summer oil sprays, including low-sulfonation test mineral oils, kerosene, herring oil, sardine oil, and vegetable oils, by R. L. Webster and J. Marshall; the pea moth, by A. J. Hanson and Webster; nonarsenicals for codling moth control, by Webster and Marshall; nonlead arsenicals, by Marshall; the cherry fruit fly, blackberry mite *Eriophyes essigi* Hass., and the pea aphid, all by Hanson; and at the Cranberry-Blueberry Substation dormant sprays, fireworm control with summer sprays, the fruitworm, and caddice flies, all by D. J. Crowley.

[Contributions in economic entomology] (*Quebec Soc. Protect. Plants Ann. Rpt., 25–26 (1932–34), pp. 23–57, 62–74, 84–134, 140–162, figs. 17*).—The contributions presented at the twenty-fifth and twenty-sixth annual meetings of the society (E. S. R., 69, p. 547), held at Macdonald College, Que., in January 1933 and April 1934, published in 1934, include the following: Recent Advances in Studies on Plant Virus Diseases [Insect Vectors], by L. O. Kunkel (pp. 23–33); The Role of Insects in Apple Pollination, by W. H. Brittain (pp. 34–37); The Effect of Climatic Factors on Bee Activity, by J. M. Cameron (pp. 37, 38); Design of a New Type of Light-Trap to Operate at Controlled Intervals, by H. L. Seamans and H. E. Gray (pp. 39–46); Some Insect Problems in Preparing and Marketing Stored Products, by H. E. Gray (pp. 47–51); Some Remarks on Fumigants, by C. R. Twinn (pp. 52–57); Forest Insects of the Gaspe Peninsula, by G. A. Tessier (pp. 62, 63); Methods of Protection against Mosquitoes and Blackflies while Camping, Hunting, and Fishing, by M. B. Dunn (pp. 64–66); The Federal Apple Maggot Advisory Committee and Its Functions, by L. S. McLaine (pp. 67–69); Crop Selection as an Aid to White Grub Control in Eastern Canada (pp. 70–72) and A Study of White Grub Losses to Individual Crops under Mixed Farming Conditions (pp. 72–74), both by G. H. Hammond; Records of Some Quebec Mallophaga and Anoplura, by W. E. Whitehead (pp. 84–87); Errata and Additions to the Insects of the Province of Quebec—Part II, Diptera, by C. E. Petch (pp. 88–90) (E. S. R., 69, p. 557); Control of the Carrot Rust Fly (*Psila rosae* Fab.), by R. P. Gorham (pp. 90–96); A Brief Account of Sampling Methods Used in Population Studies of the Jack Pine Sawfly *Neodiprion swainei* Midd'tn, by M. B. Dunn (pp. 96–100); A Preliminary Report on the Effect of Rainfall on Emergence of the Wheat Stem Sawfly (*Cephus cinctus* Nort.), by G. F. Manson (pp. 101–106); Some Feeding Experiments of the Green-House Leaf-Tier (*Phlyctaenia rubigalis* Guenée) in Relation to Temperature and Humidity, by C. W. B. Maxwell (pp. 106–110); An Insect Weather Prophet [*Aphodius distinctus* Mull.], by H. L. Seamans (pp. 111–117); Some Experiments on Temperature and Moisture and Their Effect on Disease of Red-Backed Cutworm (*Euxoa ochrogaster* Gn.), by H. L. Seamans and R. W. Salt (pp. 118–124); Recent Developments in Orchard

Spray Practices, by J. Marshall (pp. 125–134); and The Entomological Record, 1931, 1932, 1933, by W. J. Brown (pp. 140–162) (E. S. R., 66, p. 347).

Size of plot and its relationship to field spraying experiments with potatoes, H. MENUSAN, JR. (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 190–192*).—In this contribution some of the sources of error involved in determining the yield of potatoes in field experiments are discussed. "The standard deviation of a single plat decreased as the size of the plat increased. This decrease in deviation was not proportional to the increase in area of the plat. The smallest plats, 0.002 to 0.003 acre, were the most efficient considering the land and labor involved. On a unit basis it is shown that about 80 plants are required in any one treatment to measure 10 percent differences in yield."

[Contributions on insect enemies of tobacco, II–IV], J. C. VAN DER M. MOHR (*Meded. Deli Proefsta. Medan, 2. ser., Nos. 76 (1932), pp. 16, figs. 4, Eng. abs. pp. 15, 16; 85 (1933), pp. 11, pls. 2, Eng. abs. pp. 10, 11; 90 [1934], pp. 19, figs. 3, Eng. abs. p. 19*).—The second contribution (E. S. R., 67, p. 150) reports upon (1) the Surinam roach as a tobacco pest in Deli, (2) damage by grubs of *Lepidiota stigma* to young tobacco, and (3) damage by cockchafers (*Anomala viridis* F. and *Pentelia discedens* Sharp) to fermented tobacco.

The third contribution reports upon (1) some arthropods occurring on tobacco seedbeds (*Clivina indica* Putz., *Formicomus ruficollis* Saund., *Proreus simulans* Stol, and a milliped (probably *Orthomorpha gracilis* Koch)); (2) *Polanisia viscosa* D. C., a food plant of *Engytatus tenuis* Reut.; (3) *Nysius lacustrinus* Dist., a harmless capsid; and (4) mealybugs (*Pseudococcus* (?)) on the roots of old tobacco plants.

The fourth contribution includes notes on Aphididae, with a key to the commoner aphids occurring in the tobacco district of the east coast of Sumatra, notes on three species of tiger beetles (*Cicindela aurulenta* F., *C. holosericea* F., and *C. minuta* F.) common in tobacco fields, and a brief note on food plants of the tobacco stem borer *Phthorimaea heliopa* Low.

Tomato insects and their control, L. H. SHROPSHIRE (*Illinois Sta. Circ. 428 (1935), pp. 21–32, figs. 5*).—In this practical account, the pests dealt with include the potato flea beetle, eggplant flea beetle, tomato worm, tobacco worm, corn ear worm, several species of cutworms and of garden slugs, aphids or plant lice (*Macrosiphum gei* (Koch) and other species), the greenhouse white fly, eelworms or nematodes (*Heterodera radicicola* Mull. and other species), and the garden centipede.

Toxicity of fixed-nicotine preparations to certain lepidopterous pests of truck crops, M. C. SWINGLE and J. F. COOPER (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 220–224*).—In studies conducted, the details of which are given in tabular form, six substances containing nicotine in relatively insoluble and nonvolatile form and water-soluble nicotine bitartrate were tested in the laboratory against the first instar of five species of lepidopterous larvae, namely, the imported cabbage worm, diamondback moth, greenhouse leaf tier, southern army worm, and the green cutworm *Lycophotia infecta* Ochs.

"The southern army worm and the greenhouse leaf tier were much more resistant to fixed-nicotine preparations than were the imported cabbage worm, the diamondback moth, and the green cutworm. Nicotine silicotungstate was effective against all species except the greenhouse leaf tier. The three commercial nicotine preparations were nearly as effective as nicotine silicotungstate against the imported cabbage worm, the diamondback moth, and the green cutworm. Dimethyl nicotinium sulfate-bentonite was relatively ineffective against all five species."

Notes on summer contact sprays for peach, S. W. FROST (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 196, 197*).—A few experiments conducted by the Pennsyl-

vania Experiment Station for control of the red spider and oriental fruit moth are reported upon. It is concluded that there is need for further tests with summer contact sprays, especially combinations of oil emulsions and various types of sulfurs and their application to different varieties of peach.

Insect enemies of the date palm in Tunisia [trans. title], T. PAGLIANO (*Dir. Agr., Com., et Colon.* [*Tunis*], *Bul.*, *38* (*1934*), *No. 157*, *pp. 181–208*, *figs. 8*).—This account is presented with a list of 16 references to the literature.

Some factors involved in measuring results of experiments with onion thrips, G. F. MACLEOD and F. B. MAUGHAN (*Jour. Econ. Ent.*, *28* (*1935*), *No. 1*, *pp. 150–153*, *figs. 3*).—The data obtained in one of a series of control experiments with the onion thrips in Orange County, N. Y., are presented as an illustration of the need for careful interpretation of field results.

Derris dusts and oil-lead arsenate spray for squash vine borer (M[elittia] satyriniformis Hbn.), R. C. BURDETTE (*Jour. Econ. Ent.*, *28* (*1935*), *No. 1*, *pp. 229–231*).—In tests at the New Jersey Experiment Stations the application of both derris dust and oil-lead arsenate spray was followed by an increase of squash borer-free vines over the check, with the derris-talc and derris-sulfur-clay combination giving the best results. The derris-sulfur-clay dust showed an increase in weight of 74.5 percent over the check block.

Control of the spruce gall aphid in nursery plantings, F. L. GAMBRELL (*New York State Sta. Tech. Bul. 225* (*1934*), *pp. 55*, *figs. 18*).—An investigation relating to the spruce aphid as it exists under nursery conditions in New York and experiments in which different types and dilutions of spray and dust materials were compared, conducted with a view to developing a safe and satisfactory system of spray or dust practices, are reported upon with a list of 17 references to the literature.

In field experiments various types and dilutions of insecticides were tested under nursery conditions to determine their safety and efficiency and to formulate a satisfactory control program. "Tests were conducted from 1928 to 1933 in Cayuga, Onondaga, and Ontario Counties. The more promising materials tested included lubricating oil emulsions, miscible oils, tar washes, lime-sulfur, nicotine, and soaps. Applications were made in both fall and spring to determine if there was any difference in effectiveness and spray injury during these two periods. In general, the efficiency of all materials was rather high except when used at the lower dilutions or when applied too late in the spring.

"The results indicate that 1 percent lubricating oils, miscible oils diluted according to recommendations of the manufacturer, lime-sulfur diluted 1 to 11 or 1 to 40, nicotine 1 pt. and soap 2 lb., 1 or 2 percent tar washes, 2 percent nicotine dust, and soaps 10 lb. (solid) to 100 gal. water were all very efficient if applied thoroughly and at the proper time. It was also evident that high concentrations of oil sprays applied either in the fall or in the spring are likely to be attended by foliage injury."

Experimental evidence on the value of strip farming as a method for the natural control of injurious insects with special reference to plant lice, S. MARCOVITCH (*Jour. Econ. Ent.*, *28* (*1935*), *No. 1*, *pp. 62–70*).—This contribution from the Tennessee Experiment Station reports upon strip farming as a means of increasing the effectiveness of natural enemies of plant lice. Peas and cantaloups planted in strips among corn, cotton, and other plants were practically free of lice, while plats planted on the same date only 120 yd. away were destroyed. Certain plants such as tobacco and petunia, because of their sticky and gummy surface, act as a trap for beneficial parasites such as braconids and *Trichogramma*. Okra and cantaloup vines growing adjacent to tobacco and petunia were killed by the melon aphid. Although carnivorous,

ladybird beetles were kept alive for 3 to 7 weeks on molds, fungus spores, and sweets.

Cultivation of the virus of grasserie in silkworm tissue cultures, W. TRAGER (*Jour. Expt. Med., 61 (1935), No. 4, pp. 501–513, pls. 2, figs. 3*).—The author reports the development of a medium in which certain cells from the gonads of female silkworms multiply and live for periods of from 2 to 3 weeks. In such tissue cultures, strains of silkworm grasserie virus were maintained in successive passages up to the number of 10. The virus multiplied greatly, and typical polyhedral bodies formed in the cells of infected cultures.

Some further observations on the influence of artificial light upon codling moth infestations, P. J. PARROTT and D. L. COLLINS (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 99–103*).—It is concluded from further work conducted at the New York State Experiment Station (E. S. R., 71, p. 349) that light traps influence the codling moth population, and that the reduction in the number of moths, coupled perhaps with other effects of artificial illumination, is reflected in a measurable decrease in the amount of injury.

Comments upon phototropism in the codling moth with reference to the physiology of the compound eyes, D. L. COLLINS and W. MACHADO (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 103–106, figs. 2*).—The work at the New York State Experiment Station is said to have led to two significant conclusions: "(1) Of two light sources having the same continuous spectrum, the more brilliant source elicits the more rapid iris-pigment migration and is the more attractive, [and] (2) of two light sources which have unequal spectral ranges, the one including the bands which evoke the more rapid iris-pigment migration, even though its visual intensity and relative energy are less, is more attractive."

Varietal susceptibility to codling moth injury, C. R. CUTRIGHT and H. E. MORRISON (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 107–109*).—Differences in the susceptibility of apple varieties to codling moth attack are briefly considered.

The insecticidal efficiency of various nicotine compounds for control of the codling moth, 1934, S. W. HARMAN, T. W. REED, and G. L. MACK (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 109–112, fig. 1*).—Work at the New York State Experiment Station conducted on various plats has led to the following conclusions:

"The Black Leaf 155 and the Kolofog with nicotine sulfate when applied every week for 11 applications during the summer were about equally efficient in controlling the codling moth. Black Leaf 155 when used throughout the summer was very much inferior to lead arsenate spray for spray. Two weeks' interval between applications of Black Leaf 155 was too long for efficient protection. An interval of 1 week gave much better results. The bentonite-nicotine sulfate and the oil-nicotine sulfate sprays when used against the second brood of worms compared favorably in efficiency with an equal number of applications of lead arsenate. Lead arsenate was used at the rate of 6 lb. in 100 gal., as the standard 3-lb. strength did not give satisfactory control in the severely infested orchards. The combination spray of oil and nicotine sulfate was much more efficient than Black Leaf 155. Spray mixtures such as oil-nicotine and bentonite-nicotine when used following earlier applications of lead arsenate did little to relieve the residue problem, and also because of their adhesive properties were among the most difficult to remove."

Preventing spring emergence of codling moths from inaccessible places on trees, G. E. MARSHALL (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 120–122*).—In tests at the Indiana Experiment Station of 24 materials which when applied to apple trees might kill hibernating larvae, the following mixtures proved effective: (1) Parawax and alpha-naphthylamine 50 percent, by volume, (2)

tallow 70 percent and alpha-naphthylamine 30 percent, by volume, and (3) used crank case oil 70 percent and alpha-naphthylamine 30 percent, by volume, in each case the two materials being heated together and then hydrated lime added until the consistency was that of very stiff batter.

Each preparation was applied while warm with a wooden paddle to three types of inaccessible places in which 100 or more larvae had been introduced. No emergence occurred from any of the places treated. The first and third materials were almost weatherproof, but the second became fluffy and powdery within a few months, making it unsatisfactory. No. 1 after 2 yr. is said to be the least affected by weather, while No. 3 looked as though it might be effective for at least a third year.

Further experiments with fixed nicotine compounds in codling moth control, B. F. DRIGGERS and B. B. PEPPER (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 162–171*).—In further work by the New Jersey Experiment Stations (E. S. R., 71, pp. 74, 349), "12 different combinations of spray materials were tested in the two-brooded codling moth area at Glassboro. Each spray combination was tested on two varieties, Winesap and Stayman. All plats received four cover sprays for first brood during June and five during July and August for second brood. Nine combinations of fixed nicotine compounds were tested in comparison with lead arsenate and lead arsenate-summer oil.

"At the end of first brood larval entry the plats showing up the best were (1) nicotine tannate and bentonite sulfur, (2) nicotine sulfate and bentonite sulfur, and (3) lead arsenate and summer oil. The proprietary fixed nicotine compounds known as 'Black Leaf 155' were the least effective of the fixed nicotine compounds. The number of first brood larvae reaching maturity on these blocks and the block sprayed with a one-half charge of nicotine tannate and bentonite sulfur appeared to increase materially the stinging by second brood on all blocks.

"At the end of the season the materials showing up the best were nicotine sulfate and bentonite sulfur and lead arsenate and summer oil. The standard lead arsenate treatment plus three sprays of 0.5 pt. nicotine sulfate and 6 lb. bentonite sulfur to 100 gal. during first brood was also near the top. Somewhat below these materials in effectiveness were the nicotine tannate plats carrying bentonite or bentonite sulfur. The number of larvae collected weekly throughout the season from three trees in each plat, in general, support the conclusions drawn from the data on fruit counts. Nicotine analyses of fruit and foliage before and after the spray applications showed that those nicotine blocks where codling moth was most effectively controlled had the highest charge of nicotine. The fixed nicotine blocks showing poor codling moth control not only had a low nicotine charge immediately after spraying, but the nicotine that was deposited practically all disappeared during the 10-day intervals between sprays."

Research needs of codling moth control, T. J. HEADLEE (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 172–176*).—Contributing from the New Jersey Experiment Stations, the author calls attention to the further need for information on codling moth control.

Comments concerning codling moth control in Delaware, L. A. STEARNS (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 176–182, figs. 4*).—This further contribution from the Delaware Experiment Station (E. S. R., 71, p. 74) reviews the recent work on codling moth control in that State.

How we met the codling moth situation in western New York in 1934, S. W. HARMAN (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 187–189*).—In work by the New York State Experiment Station, it was found that an increased

amount of poison used under commercial conditions gave noticeably better control and often amounted to the difference between failure and success. A choice of three different treatments has been recommended thus far for severely infested plantings: "(1) 5 to 6 lb. of lead arsenate in all cover sprays; (2) 3 lb. of lead arsenate in all cover sprays, with the exception of two applications for the first brood at the time of maximum egg deposition when a combination spray of 2 lb. of lead arsenate and 1 gal. of summer oil was recommended; and (3) 3 lb. of lead arsenate in all cover sprays with the addition of 1 qt. of mineral oil or fish oil in the first brood sprays only."

The use of chemically treated corrugated bands as a supplementary control for codling moth, R. Fowler (*Jour. Dept. Agr. So. Aust., 38 (1934), No. 4, pp. 453–456*).—The results obtained with corrugated bands, first tested in South Australia in 1932–33, are reported upon and the advantages pointed out. While some 50 percent of the larvae do not enter these bands they supplement and are of value through their reduction of the work required from sprays.

Codlin moth control.—Results of experiments at Blackwood, 1933–34, R. Fowler (*Jour. Dept. Agr. So. Aust., 38 (1934), No. 4, pp. 460–466, 468, figs. 2*).—This is a report of the results obtained in continuation of work previously noted (E. S. R., 67, p. 153). The inclusion of white oils in combination with lead arsenate, or following two arsenate calyx sprays, or used alternately with arsenate of lead did not give significantly better control.

Tests of contact insecticides on the eggs of the peach moth and the codling moth, W. J. Schoene and R. N. Jefferson (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 182–184*).—A brief report of the progress of work in 1934 with ovicides, especially nicotine and oil, for the codling moth and the oriental fruit moth, the details of which are presented in two tables.

So far as the tests were made, the eggs of these two moths were affected in a like manner by sprays. This was evident in the tests with Orthol K and with Orthol K and nicotine. In these tests Orthol K, 1 percent, was effective for the eggs of both insects. The Black Leaf 40, 1–1,200 plus Orthol K, 0.75 percent, killed the eggs of the oriental fruit moth and is deserving of further tests. Orthol K was more effective than the summer scalecide, although it should be noted that there was a wide difference in the temperature at which the two series of tests were made. At nominal strengths the pyrethrum used had no effect on eggs of the oriental fruit moth.

The European corn borer and its controlling factors in the Orient, C. A. Clark (*U. S. Dept. Agr., Tech. Bul. 455 (1934), pp. 38, figs. 8*).—Studies of the European corn borer conducted in Japan, Manchuria, Chosen (Korea), and Taiwan (Formosa) from 1928 to 1932 revealed the presence of 19 species of insect parasites, among which were *Lydella grisescens* R. D., *Eulimneria alkae* (Ell. and Sacht.), *Inareolata punctoria* (Roman), *Cremastus flavoorbitalis* (Cam.), and *Macrocentrus gifuensis* Ashm. The fungus *Beauveria bassiana* (Bals.) Vuil. and the nematode *Hexamermis meridionalis* Stein. were also found to attack the larvae. The generations were found to vary in different sections from one to three in number. Of the 22 host plants recorded, the most important were hemp, corn, millet, grain sorghum, and indigo. Agricultural practices, including the method of harvesting hemp and indigo and the use of crop refuse as fuel and for other purposes which are commonly practiced in certain sections of the Orient in which the studies were conducted were found to have an important effect on the corn borer population.

The citrus leaf miner Phyllocnistis citrella St. [trans. title], A. D. Voûte (*Landbouw [Buitenzorg], 10 (1934), No. 3, pp. 138–175, figs. 12; Eng. abs., pp.*

174, 175).—This contribution relates to a lepidopterous enemy of citrus that is a common pest in most countries of southern and eastern Asia, its injury being caused through mining in the epidermis of the young leaves of citrus plants. A chalcid of the genus *Ageniaspis* is the most important enemy, parasitism by it reaching as high as 80 percent.

The biology of Rhyacia ipsilon and its control in the lake district of Sengkang (south Celebes) [trans. title], C. J. H. FRANSSEN (*Landbouw [Buitenzorg], 10 (1934), No. 3, pp. 109–137, figs. 6; Eng. abs., pp. 134–137*).—The author reports upon a biological study made of a cutworm enemy of the corn crop and its parasites in the lake district of Sengkang (Celebes).

***Actia diffidens* Curran, a parasite of *Peronea variana* (Fernald) in Cape Breton, Nova Scotia**, M. L. PREBBLE (*Canad. Jour. Res., 12 (1935), No. 2, pp. 216–227, figs. 31*).—The author presents a detailed description of the immature stages of *A. diffidens*, a tachinid parasite of the black-headed budworm *P. variana*, together with observations on the secondary integumental funnel, an ingrowth of the host body wall, within which the parasite maggots live in the later stages. "In all cases observed, the integumental funnel was attached to a restricted area on either side of the mesothorax of the host larva. As the funnel is secondarily developed, its location can hardly be determined by the oviposition habits of the parent fly. Unfortunately very little is known of the adult stage, and nothing of its mode of oviposition."

An improved method for the determination of cattle fly spray repellence, A. M. PEARSON (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 160, 161*).—In determining the value of various cattle fly spray repellents at the Delaware Experiment Station the author found the most satisfactory method to consist of "hourly observations for 8 consecutive days on cows staked individually. On the day preceding a series of tests, all of the test cows are thoroughly washed. The first 4 days constitute a preliminary period, during which all of the cows are sprayed with a base oil alone at 6 a. m. daily, and hourly fly counts are made from 7 a. m. to 4 p. m. From the results of these fly counts the cows are then placed in groups of five each on a basis of their individual fly susceptibility. The average number of flies per cow per count for each group should not vary more than about 2. During the following 4 days, the cows are sprayed daily at 6 a. m. with the same base oil, in which has been incorporated the repellent ingredient or ingredients under test. Fly counts are made as before. The preliminary period of 4 days gave more consistent results than one of shorter duration, but a longer period was not necessary in order to obtain reproducible results. By this method, various materials may be tested for relative repellence without the necessity of allowing for the repellence of the base oil, since it is used throughout an entire series."

Aside from the other benefits of using base oil during the preliminary counts, it tends to homogenize the fly population by practically eliminating the horn fly from consideration. This insect is much more easily repelled from cows than is the housefly or stable fly. It is sporadic in its attacks and cannot generally be depended upon for testing purposes throughout an entire fly season.

The codling moth control problem in districts infested with apple maggot, P. J. CHAPMAN (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 184–187*).—Contributing from the New York State Experiment Station (E. S. R., 71, p. 675), the author reports briefly upon the value of fixed nicotines and calcium arsenate in codling moth control in apple maggot infested districts. It is pointed out that the control of the apple maggot and the control of the codling moth have had to be considered as intimately related problems because stomach

insecticides are used for both species, and because the periods during which each species is susceptible to treatment are roughly parallel.

"Essentially negative results were obtained against apple maggot in 1933 with nicotine tannate and with nicotine sulfate and ammonium sulfo soap. No better results were obtained in 1934 with nicotine sulfate-bentonite (Black Leaf 155) or nicotine sulfate and bentonite-sulfur (Kolofog) applied at 10-day intervals, or four sprays, during the fly emergence period. . . . Nicotine preparations have, furthermore, given poor results against codling moth when treatments are applied at intervals of 2 or 3 weeks, although such a schedule gives excellent results with lead arsenate."

Larval production and adult emergence of the apple fruit fly in relation to apple varieties, C. O. DIRKS (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 198–203, figs. 3*).—In reporting further (E. S. R., 69, p. 244) upon work by the Maine Experiment Station, the author considers larval production and adult emergence of the apple maggot in relation to apple varieties, fly emergence by year and by variety, the period of fly emergence, and the proportion of sexes.

Substitutes for lead arsenate in cherry fruit fly control, H. GLASGOW (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 205–207*).—Contributing from the New York State Experiment Station, the author refers to work in a large sour cherry orchard that had not been sprayed since 1930 and in which during the succeeding 3 yr. the cherry fruit fly population had built up until in 1933 approximately 30 percent of the fruit was infested. Derris powder carrying 4 percent rotenone, when applied at the rate of 2 lb. to 100 gal., reduced the fruit fly infestation in that orchard from the percentage of 1933 to less than 1 percent in 1934 following three applications made during the fruit fly period.

Bionomics of the walnut husk fly (Rhagoletis completa), A. M. BOYCE (*Hilgardia [California Sta.], 8 (1934), No. 11, pp. [2]+363–579, figs. 77*).—This is an extended report of a study of the history, taxonomy, distribution, hosts, economic importance, life history and habits, seasonal history, natural enemies, and control of the walnut husk fly, previously referred to as *R. juglandis* Cress. (E. S. R., 62, p. 455; 63, p. 160) in California. Much of the data is presented in table and chart form.

Introduced into California prior to 1926, probably as larvae or pupae in black walnuts from the central region of the United States, the species assumed major economic importance as a pest of certain commercial varieties of Persian walnut (*Juglans regia*). "The area of infestation has increased yearly, and in 1932 it comprised approximately 500 sq. miles and included over 2,000 acres of commercial varieties of Persian walnut. Taxonomists confused this insect with *R. juglandis* and it was not until 1929 that it was found to be undescribed. Crasson then considered it a subspecies of *R. suavis*. . . .

"*R. suavis*, the walnut husk maggot, occurs throughout most of the eastern United States on the black walnut (*J. nigra*). This species is reported to be economically important as a pest of Persian walnut in New York, Pennsylvania, and Maryland. *R. juglandis* is probably a Mexican species and is recorded from southern Arizona and Chihuahua, Mex. Serious infestations have been observed on Persian walnut in Arizona, where it also attacks the native black walnut (*J. rupestris*). *R. boycei* is recorded from southern Arizona. It probably attacks wild and cultivated walnuts. Adults of these three species are illustrated. . . . Authentic records show that *R. completa* occurs in Nebraska, Kansas, Oklahoma, Texas, New Mexico, and California. . . .

"The principal type of injury results from the feeding of larvae within the green husk, thereby causing internal decay which permanently blackens the shell of the walnut. Such affected walnuts become 'culls', with a resultant loss in value to the producer of approximately 50 percent. The secondary

type of injury is manifested by a reduction in quality of the kernels of infested nuts. The net loss in value varies from 0 to 25 percent, according to seasonal conditions. Infested walnuts generally become 'sticktights', resulting in increased harvesting costs. Other economic considerations are the costs incident to enforcement of regulatory measures for the prevention of artificial spread into uninfested areas."

The pest has been found to be remarkably free from important natural enemies. On the basis of field control experiments, either synthetic cryolite or barium fluosilicate is recommended for general use in the control campaign in the infested area. Synthetic cryolite from different manufacturers has been found to vary in the content of sodium fluoaluminate, uncombined sodium fluoride, and various sulfates, and also in solubility in water and such physical properties as fineness and bulk or weight. An adhesive is necessary in both sprays and dusts when either cryolite or barium fluosilicate is used. After preliminary experiments with various types of fish oils and vegetable oils, and with highly refined mineral oils of different viscosities, a mineral oil with a viscosity of 95 Saybolt sec. and a sulfonation of 90 percent appears most promising as an adhesive. The formula recommended is synthetic cryolite or barium fluosilicate 3 lb., mineral oil 1 pt., and water 100 gal. From 30 to 40 gal. per average-sized tree affords satisfactory coverage. As a dust method of treatment which is less expensive than the spray method, the use of synthetic cryolite or barium fluosilicate 30 percent, diatomaceous earth 65 percent, and mineral oil 5 percent is recommended. From 3 to 4 lb. per average-sized tree affords satisfactory coverage.

The life-history and biology of Galerucella birmanica Jac. (Coleoptera, Phytophaga, Chrysomelidae, Galerucinae) and the external morphology of larva and pupa.—Part I, M. H. KHATIB (*Indian Jour. Agr. Sci., 4 (1934), No. 4, pp. 715–732, pls. 4, figs. 4*).—This is a report of a study of a beetle which attacks the leaves of the waternut (*Trapa bispinosa*), presented with a list of 51 references to the literature.

Experiments on the control of the Mexican bean beetle, 1933–1934, M. L. BOBB (*Virginia Sta. Bul. 296 (1935), pp. 11, figs. 2*).—The results of experimental tests of insecticides for control of the Mexican bean beetle during 1933 and 1934 with 16 different materials including 4 different brands of calcium arsenate, the details of which are presented in tabular form, have shown magnesium arsenate to be the most effective, it having proved to be safe for use on foliage and to prevent injury when applied either as a dust or as a spray. As a spray it should be mixed at the rate of 1 lb. to 50 gal. of water and applied at the rate of from 90 to 100 gal. per acre and as a dust at the rate of 1 lb. to from 3 to 5 lb. of hydrated lime applied at the rate of from 10 to 15 lb. per acre.

All the brands of calcium arsenate tested caused some injury to the foliage and should be used on bean foliage at the rate of 1 to 7 lb. of hydrated lime, 15 to 20 lb. per acre, only when magnesium arsenate is not available. Cal-Mo-Sul 30, a combination insecticide and fungicide, applied as an undiluted dust protected the foliage from injury and caused no visible injury to the foliage. Bari-Cide (barium carbonate) proved safe for use on bean foliage, copious applications causing no injury; but in 1933 it was the least effective in beetle control of all the poisons tested. The calcium fluosilicate applied as a dust and the Kaolith applied as a spray in these tests protected the bean foliage, and no injury was caused by the insecticides.

Effect of Mexican bean beetle injury on crop yield, N. TURNER (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 147–149*).—In continuation of the work previously noted (E. S. R., 69, p. 84), the author found that as the spacing

between bean plants was increased the percentage of reduction in yield decreased. Plants spaced 8 in. apart had a total injury of 37 percent, and plants spaced 2 in. apart had a total injury of 67.5 percent. "The reduction in yield of pods was due to a reduction in number and size of pods. As the spacing increased, the proportion of reduction due to decrease in size of pods increased. Pods from plants spaced 2 in. apart were severely injured by feeding marks of the Mexican bean beetle. This injury decreased as the spacing between plants was increased. The Mexican bean beetles deposited fewer eggs on 100 plants as the spacing between plants was increased.

"Beans planted during the first half of June showed least damage by the bean beetle as compared with plantings made at other times during the growing season. The greatest injury occurred on beans planted during the first half of July."

Characters useful in distinguishing larvae of Popillia japonica and other introduced Scarabaeidae from native species, R. J. Sim (*U. S. Dept. Agr. Circ. 334 (1934), pp. 20, figs. 8*).—The characters most convenient to use in distinguishing the larvae of the Japanese beetle and other species introduced into the United States from native forms which are frequently associated with them in the eastern part of the United States are illustrated by pen drawings and briefly described. Twenty-four species are thus figured and briefly described.

Some misconceptions regarding the effects of the cold of February 1934 on the larvae of the Japanese beetle (Popillia japonica Newman), H. Fox (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 154–159*).—It is concluded that while there is some basis for the view that "severe winters are likely to result in heavy larval mortality or possibly even extermination of the Japanese beetle, the conditions prevailing in February 1934, in localities occupied by the insect were not sufficiently extreme to lower the temperature of the soil, at the depths normally occupied by the larvae, to the lethal temperature of approximately +15° F. In the region where the Japanese beetle is of general occurrence, a heavy blanket of snow throughout practically the entire period of exceptional cold served to keep the temperature of the soil well above the lethal point, while in places, like Harrisburg, Pa., where local colonies of the insect are represented, the absence of snow during the same period was not attended with unusually heavy mortality owing to the fact that the cold, while at times severe, was too frequently interrupted by intervals of warmer weather to be effective in reducing the temperature of the soil to the fatal point."

A comparative study of wireworms in relation to potato tuber injury, G. F. MacLeod and W. A. Rawlins (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 192–195, fig. 1*).—Data on wireworm injuries to potato tubers in high and low areas of potato fields; comparative numbers of five species of wireworms, namely, *Limonius ectypus* Say, the wheat wireworm, *Melanotus communis* Gyll, *Cryptohypnus abbreviatus* Say, and *Aeolus mellilus* Say, in such areas; and comparisons of numbers of wireworms (*L. ectypus*, the wheat wireworm, and *M. communis*) in relation to frequencies of potato tuber defects are reported in tabular form. It was found that in hills where less than four tubers were present the proportion of injured potatoes increased more rapidly for any given number of wireworms than where four or more tubers occurred.

The pore size (vessel diameter) of some Australian timbers and their susceptibility to attack by the powder post borer Lyctus brunneus Stephens, J. E. Cummins and H. B. Wilson (*Jour. Council Sci. and Indus. Res. [Aust.], 7 (1934), No. 4, pp. 225–233, fig. 1*).—In the course of the authors' studies natural infestation by *Lyctus* has been recorded on 94 species of

Australian timbers, the largest minimum pore sizes ranging from 104μ to over 800μ. "Severe attack occurs in species of timber, the largest pores of which have a minimum diameter similar to, or less than, that of the smallest egg recorded, namely 110μ. The percentage of such pores is sometimes only small. The maximum diameter of the 'normal' *Lyctus* egg is not the only factor governing the pore size necessary for oviposition, as oviposition definitely and commonly occurs in vessels less than 110μ in diameter. It appears that the limiting minimum pore diameter for oviposition in Australia is about 90μ, and that the sapwood of timbers with pore sizes above 90μ cannot be considered as immune to attack, provided other factors are satisfactory. Parkin's theory gives a satisfactory explanation of those cases of oviposition in pores of less diameter than that of a 'normal' *Lyctus* egg. The limit of pore size in which infestation may occur in Australia appears to be somewhat higher than the actual dimension of the ovipositor recorded by [E. A.] Parkin."[3]

Bark beetles and the Dutch elm disease, E. P. FELT (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 231–236*).—The author here presents a survey of the evidence relating to the European elm bark beetle *Scolytus multistriatus* Marsh as a disseminator of the Dutch elm disease in America.

A revisional study of the genus Scolytus Geoffroy (Eccoptogaster Herbst) in North America, M. W. BLACKMAN (*U. S. Dept. Agr., Tech. Bul. 431 (1934), pp. 31*).—The author's systematic study of bark beetles, presented in connection with a list of 44 references to the literature, has led to the conclusion that the generic name *Scolytus* Geoffroy should stand and that *Eccoptogaster* Herbst is a synonym. A full key to the North American species of the genus is followed by a detailed description of each species, including, in addition to previously known forms, several species introduced from Europe and nine described as new, namely, *S. reflexus*, *S. wickhami*, *S. oregoni*, *S. robustus*, *S. opacus*, *S. abietis*, *S. sobrinus*, *S. laricis*, and *S. fiskei*. The economic importance of several species of the genus is briefly considered.

The plum curculio in Virginia, A. M. WOODSIDE (*Virginia Sta. Bul. 297 (1935), pp. 20, figs. 8*).—The results of laboratory and field studies of the plum curculio extending over a period of 5 yr. are reported upon, the details regarding its biology being presented in tabular form.

Although the insect is present in most Virginia stone fruit and apple orchards every year, only occasionally does it appear in sufficient numbers to cause heavy damage. The overwintered adults commence to enter the orchards when peaches are in bloom or soon thereafter, the greatest number entering at shuck-fall time. "The adults feed first on the young leaves and flowers and later on the fruit. They begin to deposit eggs when the shucks are falling and continue to do so as long as they remain in the orchard. The earliest drops contain most of the larvae in sprayed orchards. Larvae begin to leave the fruit soon after the middle of May. The pupal stage occurs in June and averages about 10 days in length. Adults emerge in July and August and feed on peach and other fruits. There is usually no second brood of any importance, though some of the summer adults may deposit eggs.

"Three arsenical sprays are recommended, the first immediately after the petals have dropped, the second when the shucks have split, and the third when most of the shucks have fallen. Spraying is more effectve than dusting. A winter clean up of hibernating quarters is of great value in destroying the adults. The infestations can be greatly reduced by jarring the trees and collecting the adults. Infested drops should be collected and destroyed

[3] Empire Forestry Jour. [London], 12 (1933), p. 266.

promptly. Infested culls should likewise be removed promptly or destroyed. Many pupae can be killed by three thorough cultivations in June."

Contribution to the study of the diseases of honeybees [trans. title], S. Métalnikov and L. Kostritsky (*Compt. Rend. Soc. Biol. [Paris], 114 (1933), No. 39, pp. 1290, 1291*).—The provisional names *Bacterium apis* No. 1, *B. apis* No. 2, and *B. apis* No. 3 are given to three biologically different forms very virulent for the bee that gain entrance through ingestion and cause a typical disease. Two of the forms were obtained from the blood, the third from dejections of diseased bees received in June 1933 from an apiculturist at Puy-de-Dôme (Riom). All three lots of eight bees each that were fed a sirup containing cultures of the three forms, respectively, succumbed in from 1 to 4 days, all of the control lot remaining active.

Ascogaster carpocapsae Viereck in relation to arsenical sprays, J. A. Cox and D. M. Daniel (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 113–120, figs. 4*).—In work at the New York State Experiment Station it has been found that "mature codling moth larvae which have been parasitized by *A. carpocapsae* are only one-fourth to one-third the size of normal larvae and are therefore easily distinguished in the field. Collection of some 113,400 codling moth larvae from orchards in western New York during the past 4 yr. showed a pronounced difference in percentage of parasitism by *A. carpocapsae* in sprayed and unsprayed plantings. In each of these years the average percentage of parasitism in unsprayed orchards was more than twice that in sprayed orchards.

"More comprehensive data [are] needed to solve the following important problems: (1) The effect on parasitism of increasing or decreasing the number of arsenical sprays, (2) the effect on parasitism of timing of sprays in relation to abundance of the parasite, and (3) the ultimate effect of the general use of chemically treated bands on the population of the parasite.

"Tests revealed that female parasites exposed to foliage sprayed with arsenicals lived one-half as long and parasitized one-half as many eggs as those exposed to clean foliage. Thus there appears to be remarkable correlation between the results of laboratory work and the field counts. Parasitized codling moth larvae were as resistant to arsenicals as normal larvae."

Studies of Exeristes roborator (Fab.), a parasite of the European corn borer, in the Lake Erie area, W. A. Baker and L. G. Jones (*U. S. Dept. Agr., Tech. Bul. 460 (1934), pp. 27, pls. 2, figs. 7*).—This contribution relates to studies of an external ichneumonid parasite of the European corn borer generally distributed throughout Europe that was among the first to have been introduced and subsequently liberated in all the principal infested areas in the United States. It was found that a laboratory environment of 80° F. and 70 percent relative humidity is near the optimum for the parasite's development. A larval diapause is commonly associated with this insect, which is best survived in an environment conducive to slow development as produced by temperatures of 33° to 36°.

Although this parasite, in many instances, became established in the United States following releases of adults when full-fed hibernating corn borer larvae were present, its permanent acceptance into the complexes of the new environment is not evident. It appears from field studies that the limiting factors of this nonacceptance are the nonharmony of the seasonal cycle of the parasite and that of its host, the nonharmony of the seasonal cycle of the parasite and that of other known potential hosts, and the low biotic potential of the parasite under field conditions.

Further notes on breeding Macrocentrus ancylivorus on larvae of the oriental fruit moth, P. Garman and W. T. Brigham (*Jour. Econ. Ent., 28

(1935), No. 1, pp. 204, 205).—These notes contributed from the Connecticut [New Haven] Experiment Station supplement the data given in Bulletin 356 (E. S. R., 71, p. 77).

Methods of determining the degree of parasitization of twig-infesting oriental fruit moth larvae, H. G. BUTLER (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 244–246*).—In an investigation of the relationship existing in Tennessee between the several parasites of the oriental fruit moth and their host, commenced in 1930 and continued through 1933, it was found that *Macrocentrus delicatus* Cress., which attacks the host larvae in peach twigs, is the only parasite of economic importance in that area.

Biology of Tomostethus multicinctus (Roh.), a sawfly attacking ash, G. S. LANGFORD and H. S. McCONNELL (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 208–210, fig. 1*).—This contribution reports upon observations made during the last half of 1933 and in the year 1934 of *T. multicinctus*, a sawfly which has defoliated white ash each year for at least the last 5 yr. in scattered localities in central Prince Georges County, Md. California privet and Japanese honeysuckle are the only other plants upon which this sawfly has been observed to feed.

The economic importance of the Cynipidae, A. C. KINSEY (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 86–91*).—A brief review presented in connection with 75 references to the literature, a list of 16 of which is given.

A new mite (Neotetranychus buxi n. s. Garman) on boxwood, D. T. RIES (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 55–62, figs. 4*).—The importance, biology, and control measures for a new mite, a technical description of which by Garman under the name *N. buxi* n. sp. is incorporated, are considered. This mite was observed heavily infesting the foliage of boxwood in a number of localities throughout Oakland and Wayne Counties, Mich. The preparations of (1) nicotine, soap, and water and (2) nicotine, molasses, and water used in controlling the boxwood leaf miner are said to have also given good results against the boxwood mite. The preparation of glue and water as recommended for red spider on evergreens was used with extremely promising results in combating adults, immature quiescent forms, and eggs. All the pyrethrum compounds used gave excellent results against the active forms, but very little control was obtained with the eggs or quiescent forms.

Control experiments on certain Tarsonemus mites on ornamentals, F. F. SMITH (*Jour. Econ. Ent., 28 (1935), No. 1, pp. 91–98*).—In a study made of the tarsonemid mites on ornamentals two economic species, the broad mite and the cyclamen mite, were found to attack large numbers of plants either separately or together. One or more of 5 new species of mites, which appear to have saprozooic habits, are associated with these two mites. Certain of these live on moist or dry dead plant material, such as leaves, seed pods, or seeds. Since the broad mite and the cyclamen mite in experiments did not survive for more than a short time on such material, it is believed that earlier workers failed to recognize these new species of mites as being distinct from the cyclamen mite.

"In experimental tests on control, [*T.*] *latus*, in adult and larval stages, was killed within an hour by any of several types of sulfur dust, and single applications of this material controlled infestations on several greenhouse crops. By fumigation with calcium cyanide, the adult, larval, and egg stages of *T. latus* were killed when rates of ⅝ oz. per 1,000 cu. ft. in a fumigation box and 1 oz. in greenhouses were used—the same dosages as were required to kill *Heliothrips haemorrhoidalis*. Such high dosages, however, are not tolerated by certain plants. Higher kills of *T. latus* during fumigation occurred at temperatures of 56° to 65° than at 66° to 80° F.

"Adults, individuals in the quiescent stage, and larvae of *T. latus* were killed by vaporizing 2 oz. of naphthalene per 1,000 cu. ft. in a fumigation chamber or by broadcasting naphthalene on the soil surface and covering the plant for 17 hr. with a bell jar or other container. Red spider mites (*Tetranychus telarius*) were also killed in the tests.

"In parallel tests exposed [*Tarsonemus*] *pallidus* mites were killed in 3 days by sulfur, but those not exposed were unaffected. Infestations of this species were not killed out in commercial tests by three dustings with sulfur. This species was not affected by fumigation with calcium cyanide or with naphthalene as were *T. latus* and the [common] red spider. Because of previous reports of successful control by these materials it appears that [*T.*] *latus* rather than [*T.*] *pallidus* was the species concerned. Infestations of [*T.*] *pallidus* were successfully controlled by immersion for 20 min. in water at 108°, and of both [*T.*] *pallidus* and [*T.*] *latus* by a 15-min. immersion in water at 110°.

"Based on the experimental work thus far conducted, it appears that (1) proper cultural practices have an important bearing on the control and elimination of both mites in the greenhouse, but (2), where cultural methods have failed, sulfur (one or two applications) gives the best control for [*T.*] *latus*, and (3) a heat treatment, such as immersion in hot water, is the most effective control for [*T.*] *pallidus*."

The biology of the black widow spider, Latrodectus mactans, W. L. Jellison and C. B. Philip (*Science, 81 (1935), No. 2090, pp. 71, 72*).—The observations made by the authors in Montana here noted suggest that rodent burrows form an important natural habitat for the breeding and hibernation of *L. mactans* in the Northwestern States.

The life history of Leidynema appendiculata (Leidy), a nematode of cockroaches, C. G. Dobrovolny and J. E. Ackert (*Parasitology, 26 (1934), No. 4, pp. 468–480, pl. 1, figs. 10*).—In this contribution from the Kansas Experiment Station the authors report that "of 259 cockroaches (*Periplaneta americana*) collected at Manhattan, Kans., 86.3 percent were infested with one or two species of oxyurids, *L. appendiculata* and *Hammerschmidtiella diesingi*. The highest incidence was among the immature roaches, of which 94.2 percent were infested; next was in the adult females with 87.5 percent infested; and lastly among the mature males with 79.5 percent parasitized. The female roaches carried the heaviest infestations and the young *P. americana* the lightest.

"Uninfested cockroaches were obtained by rearing the young from oöthecae. Oxyurid eggs in moist chambers remained viable for at least 2 mo. Eggs of all stages when exposed to direct strong artificial or natural light for 15 min. failed to continue development. Fertilized eggs incubated at 37° C. in dilute Locke's solution develop to the active embryonated stage in 20 to 36 hr.; in 4 to 7 days they develop to the resting embryonated stage. Regardless of the mediums utilized eggs failed to hatch in vitro. Feeding experiments proved that transmission is direct. Eggs in the resting embryonated stage are infective; those in the actve embryonated stage do not appear to be infective."

ANIMAL PRODUCTION

Statistical method in planning and interpreting animal nutrition experiments, H. W. Titus (*Poultry Sci., 13 (1934), No. 6, pp. 358, 359*).—In this paper from the U. S. D. A. Bureau of Animal Industry the author reviews the history and developments in the use of statistical methods in nutrition experiments.

[Investigations with livestock in Alabama] (*Alabama Sta. Rpt. 1933, pp. 19, 20, 21, 22–24*).—Results are reported from an investigation of protein sup-

plements to white corn for fattening hogs in dry lot, by J. C. Grimes, W. E. Sewell, and G. J. Cottier.

In poultry studies information was obtained on simplified rations for chicks, force molting and time of employing the practice when all-night lighting was used, and efficient rations for laying hens, all by G. A. Trollope, D. F. King, and C. T. Bailey.

[Experiments with livestock in Hawaii] (*Hawaii Sta. Rpt. 1934, pp. 25, 26*).—Tests with swine yielded information on the feeding value of avocados, papayas, and cooked taro scraps, and feeding sprouted oats to sows with irregular breeding habits.

With poultry results were obtained in tests on artificial illumination for laying stock, tree kale as a source of green feed, batteries for laying and breeding stock, and plantation back-yard poultry houses.

[Investigations with livestock in Kansas] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 60–71, 85, 87–89, 116, 128, 129, 131, 132*).—In studies with beef cattle results were obtained on the use of silage for fattening beef cattle, and a comparison of different levels of protein intake for fattening steer calves, both by A. D. Weber and W. E. Connell; methods of utilizing native pasture in beef cattle feeding, by C. W. McCampbell and Connell; factors which influence the quality and palatability of meat, including cooking and metabolism tests, by McCampbell, D. L. Mackintosh, J. L. Hall, M. S. Pittman, and M. M. Kramer; and utilization of western Kansas feeds for the maintenance of beef cattle at the Fort Hays Substation.

Swine investigations yielded data on nutritive requirements of swine, by C. E. Aubel and J. S. Hughes; swine feeding investigations, by Aubel and Connell; and sources of calcium for growing pigs, by McCampbell and Aubel.

With sheep results are reported on lamb feeding investigations, by R. F. Cox and Connell; and rations and methods of fattening lambs at the Garden City Substation.

With poultry data were obtained on turkey production, including a study of the effect of age of breeding turkeys, a comparison of the post-embryonic growth of Narragansett and Bronze turkeys, the effect of gonadectomy on the secondary sexual characteristics, and the response of breeding turkeys to artificial illumination, all by H. M. Scott; growth of Leghorn embryos as influenced by a ration deficient in vitamin A, by Scott and Hughes; the management of Leghorn hens and pullets with and without artificial light and heat, by L. F. Payne; etiological factors involved in the malformation of bones in young chicks, by Payne and Hughes; and the deterioration of the proteins of eggs under cold-storage conditions, by H. H. King.

[Livestock investigations in Nevada] (*Nevada Sta. Rpt. 1934, pp. 27, 28, 37–42, figs. 3*).—Experiments with livestock yielded information on methods of producing more and better lambs in Nevada range flocks, by C. E. Fleming; pasturage and silage production for sheep, by Fleming, M. R. Miller, and A. Young; the value of coconut oil meal in rations for swine, and the economic efficiency of alfalfa hay as a sole ration for dairy cattle and its relation to sterility, both by F. B. Headley and R. Wilber; and turkey feeding experiments, by Headley.

[Investigations with livestock in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 67–85, 94–129, 130–139, 140, 141, 177–184, figs. 5*).—Data obtained in studies with beef cattle are reported on hastening the market maturity of calves by feeding grain while weaning, by L. E. Hawkins; the influence of breeding on type and gains in beef cattle, by Hawkins, W. L. Blizzard, and W. A. Craft; rations for fattening steers, by Blizzard and Hawkins; and management of native pastures, by Blizzard, Hawkins, and B. F. Kiltz.

Investigations with swine yielded information on kafir, cottonseed meal, and alfalfa in the hog ration, by C. P. Thompson; and preventing anemia in young pigs, by L. H. Moe, Craft, and Thompson.

Results of experiments with sheep are given on the relationship of the physical characteristics of wool fibers from different breeds of sheep, by A. E. Darlow and Craft; a comparison of roughages for lambs, and the effect of the ration on wool growth and on certain wool characteristics, both by Darlow; the influence of nutrition on the physiology of reproduction in sheep, by Darlow and Hawkins; and methods of curing lamb, by J. A. Beall and D. I. Purdy.

In poultry studies results were obtained on alfalfa meal for supplementing wheat as a poultry feed, the similarity of soybean meal to cottonseed meal in poultry mashes, effect on egg quality of five different vegetable proteins, effect of the hens' environment on egg quality, high- and low-fiber mashes and egg quality, and the poor quality of eggs produced by wheat smut, all by R. B. Thompson; yolk color of eggs produced by hens fed various feeds and pigments, the poor quality of eggs from scavenger hens, turkey shelters, the influence of various amounts of protein and an all-grain ration on the growth of turkey poults, and morning lights for increasing egg production in Bronze turkeys, all by Thompson and W. P. Albright; the commercial value of caponizing, pheasant and quail propagation, and the effects of various kinds and amounts of fiber in the chick ration, all by R. Penquite and Thompson; growth of chick embryos from hens fed at different protein levels, and the importance of green feed in the ration of forced breeding hens, both by Penquite; feather growth and development in chicks, and observations on pale eye in poultry, both by L. Morris; market quality studies, and preventing injury to turkey females, both by Albright; tenth and eleventh Oklahoma egg-laying contests, and vitamin G from cottonseed meal in the chicken ration, both by O. E. Goff and Thompson; observations on turkey poults receiving rations varying in fiber content, by Goff; and effect of time of hatching on Single Comb Rhode Island Red chickens, by Morris and Thompson.

Nutrition investigations yielded data on the chemistry of cottonseed and its products, including gossypol and the vitamin content of cottonseed meal rations, by W. D. Gallup; and new problems concerning the function of iodine, calcium, phosphorus, sodium, potassium, chlorine, and sulfur in nutrition, by V. G. Heller.

[Experiments with livestock in Oregon] (*Oregon Sta. Bul. 334 (1934), pp. 43, 44, 54, 55, 61, 62, fig. 1*).—Results obtained in tests with animals are reported on marketing of country-slaughtered livestock, irrigated sheep pastures, Willamette Valley corn for hog feeding, and baby beef fattening and winter rations at the Eastern Oregon Substation.

With poultry information was obtained on mineral requirements for brooder chicks, electrical brooding, and turkey growing under confinement at the Umatilla Substation.

[Livestock investigations in Washington] (*Washington Sta. Bul. 305 (1934), pp. 25, 26, 27, 28, 32, 33, 51, 52*).—Data were obtained in studies on the nutritive value of winter range grasses, by R. McCall; nutritive value of cereal hays, by J. Sotola; the effect of the temperature of drying upon the digestibility and availability of nitrogen, calcium, and phosphorus of pasture herbage as determined with sheep, by R. E. Hodgson, J. C. Knott, R. R. Graves, and E. V. Ellington; the determination of apparent digestibility by the ratio of the nutrient to the iron or silica in the diet, by Knott, H. K. Murer, Hodgson, and Ellington; and feeding lambs en route to market, by H. Hackedorn.

In poultry investigations results are reported on the nature of watery whites in eggs, by J. L. St. John and A. B. Caster; a comparison of commercial protein supplements for growing chicks, by St. John and O. Johnson; and protein requirements of laying hens and growing chicks, by V. Heiman and J. S. Carver.

Approximate commercial values of feeding stuffs for ruminants calculated from their contents of digestible protein and productive energy, G. S. Fraps, A. R. Kemmerer, and F. D. Fuller (*Texas Sta. Control Circ. 6 (1935), pp. 8*).—In this circular an attempt is made to compare the values of different feeds for beef cattle, sheep, or similar ruminants on the basis of their relative contents of digestible protein and productive energy.

Keeping quality of baled corn stover as affected by moisture content of the stover and density of the bale, J. B. Shepherd, T. E. Woodward, and R. R. Graves (*U. S. Dept. Agr., Bur. Dairy Indus., Roughage Feed. Ser. 4 (1934), pp. 10*).—Continuing these studies (E. S. R., 71, p. 830), an investigation was made of the effect of the moisture content of stover on its keeping quality when baled, and also the effect of the density or compactness of the bale. Both long and shredded stover were included.

A number of factors influenced the heating of bales during storage. Both the density of the bale and the moisture content of the stover at the time of baling affected the temperature range. Other things being equal, shredded stover had a tendency to reach higher temperatures than long stover. There was a close relationship between the moisture content of the stover and the degree of mold growth. The latter factor also followed quite closely the degree of temperature attained.

Inspection of commercial feedstuffs, P. H. Smith (*Massachusetts Sta. Control Ser. Bul. 75 (1934), pp. 55*).—This is the usual report of the official chemical and microscopic analyses of 1,641 samples of feeding stuffs intended for livestock and poultry consumption collected during the year ended September 1, 1934 (E. S. R., 71, p. 231).

Commercial feeding stuffs, September 1, 1933 to August 31, 1934, F. D. Fuller and J. Sullivan (*Texas Sta. Bul. 502 (1934), pp. 227*).—This is the usual report of the results of chemical analyses and microscopical examination of 2,971 samples of feeding stuffs officially inspected (E. S. R., 71, p. 231).

Pasturing winter wheat in Kansas, A. F. Swanson (*Kansas Sta. Bul. 271 (1935), pp. 30, figs. 8*).—This information from the Fort Hays Substation was prepared to show the effect of grazing on the yields of wheat, methods of utilizing the crop as a green pasture with the least reduction in grain yield, the nutritive value of green wheat pasturage, and the gains that may be expected from such pasture when supplemented with dry feeds.

It was found that moderate grazing properly managed did not usually reduce the yield of wheat and sometimes increased the yield. Under unfavorable conditions grazing caused heavy losses in grain yield. Gains were increased when livestock pasturing wheat had access to dry feed. On the other hand, the pasturing of wheat reduced the amount of dry feed required to winter animals from 75 to 85 percent. Silage was a good substitute for green wheat during bad weather, especially for lambs.

In the fall from 5 to 7 acres were required to carry a mature animal, while in the spring only 2 to 4 acres were necessary. For yearlings about three-fourths and for calves one-half this acreage was needed. Gains in open seasons varied from 200 to 300 lb. per head for mature cattle and from 100 to 200 lb. for calves and yearlings. No special cultural methods were employed in producing the stands for grazing other than seeding somewhat earlier and

at times increasing the rate of seeding about 1 pk. per acre. Pasturing winter wheat tended to reduce the number of culms, retarded maturity, and prevented lodging.

Wintering steers in the Black Belt of Alabama, J. C. Grimes, W. E. Sewell, and G. J. Cottier (*Alabama Sta. Circ. 71 (1935), pp. 8, fig. 1*).—A series of three experiments covering a period of 7 yr. were undertaken to determine the value of Johnson grass hay fed in different ways for wintering steers.

Steers fed Johnson grass hay alone from racks lost an average of 46 lb. per head during 3 winters. On the other hand, an unlimited feed of the hay plus 1 lb. of cottonseed meal per head daily resulted in an average gain of 48 lb. per head during the same period. Wintering steers in the hayfield where they had free access to Johnson grass haystacks resulted in an average gain of 41 lb. per head during 2 winters. Adding 1 lb. of cottonseed meal per head daily to a ration of Johnson grass hay self-fed from a rack or from a haystack was the most satisfactory method of feeding during the average winter and was the most consistent in producing good gains at a moderate cost.

Sheep investigations and management practices in the Upper Peninsula, L. H. Blakeslee (*Michigan Sta. Spec. Bul. 255 (1935), pp. 24, figs. 11*).—The results of 5 years' experimental work are reported in this bulletin.

It is recommended that during the gestation period ewes should receive 4 lb. of good quality hay per head daily, but daily rations of 3 lb. and 2 lb. of clover or alfalfa hay, the latter supplemented with 1.8 lb. of oat straw, were satisfactory if 0.5 lb. of grain was added 6 weeks before lambing. Where limited rations are fed ewes should be young, full-mouthed, and free from parasites. Limited feeding, if supplemented with grain previous to lambing, did not retard development of the fetus or reduce the milk supply. Ewes bred to lamb late in May or early in June required no grain feeding before lambing if they were in good condition.

Flocks in this region should be dipped annually to control ticks and lice, and where there are unthrifty lambs or where the pastures have been previously used by sheep the flock should be drenched every 4 weeks for internal parasites. Purebred Hampshire and Lincoln rams sired large, vigorous lambs, while Shropshire, purebred Black Top Delaine Merino, and Rambouillet rams sired vigorous but smaller lambs. Lambs by the Hampshire and Lincoln rams were more active on the cut-over pastures than lambs by the other rams. Ewes showing a predominance of all the above breeds except Shropshires were good mothers, while ewes sired by Black Top Merino and Lincoln rams were outstanding in weight of fleece produced. Hampshire and Shropshire ewes produced light fleeces of good staple length, while Rambouillet ewes produced heavier fleeces with a shorter staple. The use of good type, thickly fleshed, and heavily fleeced rams is recommended.

Raising reindeer in Alaska, L. J. Palmer (*U. S. Dept. Agr., Misc. Pub. 207 (1934), pp. [1]+41, figs. 18*).—This account, which supersedes that presented in Circular 82 (E. S. R., 62, p. 364), takes up the development of the reindeer industry in Alaska, the characteristics of reindeer, character of the reindeer range in Alaska, range management, herd management, and cooperation and experience. It is pointed out that under authorization of Congress a study of the reindeer was commenced by the Bureau of Biological Survey in 1920, and that in cooperation with the Alaska College of Agriculture and School of Mines the investigations are being continued at the Reindeer Experiment Station, College, Alaska, at substations at Nome and on Nunivak Island, and on the ranges.

Summer and winter rations for fattening hogs, H. H. Smith and E. J. Maynard (*Utah Sta. Bul. 254 (1935), pp. 24, fig. 1*).—These studies were conducted with over 300 pigs to determine the relative values of tankage, skim

milk powder, and semisolid skim milk protein when fed with ground barley or wheat in dry lot or on alfalfa pasture, the value of alfalfa pasture for fattening swine, and to compare barley and wheat in dry lot and pasture rations.

Skim milk powder produced larger gains but was not as economical as tankage for fattening hogs. Feeding tankage on alfalfa pasture did not save enough feed to make it economical. While any of the above supplements improved a grain-alfalfa-pasture ration, skim milk was the most efficient and economical. Ground wheat was worth a little more than barley for pigs on alfalfa pasture, and when low in price wheat was a satisfactory hog feed. Feeding alfalfa hay with grain in dry lot produced gains equal to those made on pasture, but pasture production was more economical than dry-lot production. Equal parts of skim milk powder and tankage produced higher gains in dry lot than tankage but were not as economical. Semisolid skim milk, due to its cost of preparation, was not an economical feed.

Nineteenth annual report, 1934, [by the] Oklahoma Livestock Registry Board (*Oklahoma Sta. Circ. 81 (1935), pp. 48*).—In addition to the list of licensed stallions and jacks by counties, articles are included on Hints to Horse Breeders, by W. A. Craft; Feeding and Care of Horses, by L. E. Hawkins; and Artificial Insemination, by C. H. McElroy.

Management of Leghorn hens and pullets with and without artificial lights, L. F. Payne and L. J. Simmons (*Poultry Sci., 13 (1934), No. 6, pp. 323–332, figs. 2*).—The Kansas Experiment Station undertook a study to compare the costs and returns from White Leghorn yearling hens and pullets with and without artificial lights. Four lots of 100 birds, each consisting of two lots of pullets and two lots of hens, were on test through 13 periods of 4 weeks each. One lot of hens was furnished with two 25-w bulbs which were burned from 4 a. m. to daylight from August 15 to April 1, while the lighted pullets received the same treatment from October 1 to April 1.

All lots showed a marked preference for wheat over shelled corn at all seasons of the year. The annual returns for market eggs were not increased by giving pullets morning light, but the opposite was true in the case of hens. A larger percentage of thin-shelled eggs was produced by the birds in the lighted lots than by the unlighted birds. A greater percentage of the hens' eggs were graded as "bests", while one-third or more of the pullet eggs were placed in the third grade. The differences in hatchability of eggs and mortality were not great, but the pullets excelled somewhat in these respects. When all factors were considered, the hens with and without lights were more profitable than pullets with or without lights.

A "weigh-back" system for feeding laying hens, R. H. Waite (*Maryland Sta. Bul. 367 (1934), pp. 101–120, figs. 13*).—A feeding system designed to minimize the need for feeding skill by the poultryman is described. Allotments of grain feed for any given day based on a mathematical calculation of the average daily consumption of feed during the preceding week are given in tabular form. A device designed to assist in the feeding of grain, known as the "dump pan", is described, together with an indoor mash feeder of the "reel" type and other useful devices. The rations used in the Maryland egg-laying contest and the station laying mash are given.

Hopper versus litter feeding of grain, J. H. Martin and W. M. Insko, Jr. (*Poultry Sci., 13 (1934), No. 6, p. 380*).—A series of experiments was conducted at the Kentucky Experiment Station to compare the feeding of grain in hoppers and in litter to laying pullets. The feed consumption per dozen eggs was practically the same for Leghorns, although there was slightly more grain and less mash consumed by the birds fed grain in hoppers. Barred Plymouth Rocks and Rhode Island Reds consumed more feed per dozen eggs produced

when hopper fed, but they ate less mash and more grain as compared with the litter-fed birds. Since mash is usually more expensive than grain, it was felt that the cost of feed may be less when the birds are fed their grain in hoppers.

The effect of the protein level of the ration upon certain blood constituents of the hen, W. C. Russell and A. L. Weber (*Poultry Sci., 13 (1934), No. 6, pp. 376–378*).—Studies at the New Jersey Experiment Stations revealed that the nonprotein nitrogen, uric acid, urea nitrogen, creatine, and blood sugar of the blood of hens fed at a low protein level were essentially the same as were found when the hens were fed a high protein level. The greatest difference was in the percentage of creatine, which had a higher value when the low protein level was fed. It is concluded that determinations of the above-named blood constituents did not afford a method for the study of the effect of different protein levels on the hen.

A nutritional disease demonstrating a feed deficiency in dried eggs, W. C. Tully and K. W. Franke (*Poultry Sci., 13 (1934), No. 6, pp. 343–347, figs. 5*).—In tests at the South Dakota Experiment Station a pellagralike syndrome appeared in chicks fed 15 percent of dried whole egg plus 5 percent of dried buttermilk as animal protein supplements in a ration thought to be otherwise complete. The addition of 3 or 5 percent of Yeast-Foam tablet powder or 5 percent of similar yeast plus 3 percent of meat and bone scraps to the above ration did not prevent this trouble. On replacing the dried whole egg with meat and bone scraps the symptoms did not appear.

Is phosphorus a causative factor in the production of slipped tendon? W. M. Insko, Jr., D. F. Sowell, and M. Lyons (*Poultry Sci., 13 (1934), No. 6, pp. 370–375*).—In studies with White Leghorn and Barred Plymouth Rock chicks at the Kentucky Experiment Station it was found that a widening of the calcium-phosphorus ratio with an accompanying increase of calcium from 0.4:1 to 3.1:1 did not increase the percentage of slipped tendons. There were, however, noticeable differences in the average weight of the chicks in the various lots at 10 weeks of age. Increasing the bone meal content of the ration, which increased the phosphorus content even though the calcium-phosphorus ratio remained approximately the same, produced a noticeable increase in the percentage of slipped tendons.

Proteins of the egg shell, H. J. Almquist (*Poultry Sci., 13 (1934), No. 6, p. 375*).—An investigation at the California Experiment Station yielded evidence to prove that the protein of eggshell matrix was different from that of the membranes. The matrix exhibited the general properties of the collagen class of proteins.

Studies on the specific gravity of hens' eggs: A new method for determining the percentage of shell in hens' eggs, N. Olsson (*Leipzig: Otto Harrassowitz, 1934, pp. 16, figs. 5*).—No significant correlation was found between the total weight and specific gravity of new-laid eggs produced under similar conditions, but there was a significant positive correlation between the total weight and volume of the eggs. After the eggs had cooled to room temperature the volume of the air cell was positively correlated with the weight (volume) of the egg, the coefficient of correlation being 0.31 ± 0.06. A high positive correlation was found between specific gravity and the percentage of shell weight of the total weight of the egg immediately after being laid. On this basis specific gravity was a good measure for the percentage of shell. With a normal percentage of shell, in a population of eggs the mean of the eggs' specific gravity lay between 1.085 and 1.09 when calculated immediately after laying.

Heterotaxia in chick embryos, L. W. Taylor (*Poultry Sci., 13 (1934), No. 6, p. 378*).—Experimental evidence at the California Experiment Station indicated

that heterotaxia in chick embryos occurred spontaneously with great rarity in eggs incubated normally and caused no apparent reduction in hatchability.

Methods of feeding ducks, R. E. ROBERTS (*Poultry Sci., 13 (1934), No. 6, pp. 338-342*).—Three experiments involving nine lots of Pekin ducks were run at the Indiana Experiment Station to obtain information on the value of feeding a moist mash at intervals as compared with leaving it before the ducks at all times and to compare the relative merits of feeding a moist or dry mash.

The all-mash chick-starting ration used produced satisfactory gains when fed ad libitum as a dry mash to ducklings. Only a slight increase in growth resulted from feeding the same ration as a moist mash four times daily. Feeding the moist mash ad libitum produced a significant increase in growth rate as compared with the other two methods of feeding. Only slight differences in feed requirements per unit of gain were found with the different methods of feeding. There were no apparent differences in mortality which could be attributed to the methods of feeding.

The influence of protein on the growth of ducks, W. L. HAMLYN, H. D. BRANION, and J. R. CAVERS (*Poultry Sci., 13 (1934), No. 6, pp. 333-337, fig. 1*).—Tests were made at the Ontario Agricultural College to find the optimum protein level for raising market green ducks and to obtain information on the relative values of various animal and vegetable proteins.

A level of 25 percent of total protein was found to approach an excess of this nutrient for growing ducks. The optimum level appeared to be 18 percent or less, indicating that ducklings utilized protein more efficiently than did chicks. When fed at the same crude protein level a single protein supplement appeared to be as efficient for promoting growth as a mixture of proteins. In a ration having a total protein level of about 21 percent, vegetable protein could be substituted for 5 percent of the animal protein.

A comparison of the growth of the Ontario inbred strain of ducks with the reported growth of White Pekin ducks indicated that inbreeding had not been harmful. An extremely low coefficient of variation for the inbred strain indicated that it would be valuable for nutritional research.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle in Hawaii] (*Hawaii Sta. Rpt. 1934, pp. 24, 25*).—Information obtained in tests with dairy cattle is reported on alfalfa hay as a supplement to green roughages, a comparison of the feeding value of green Sudan grass and green panicum grass, the feeding value of the shredded leaves and stumps of pineapple plants, the value of cane molasses in the dairy ration, and feeding sprouted oats to cows with irregular breeding habits.

[Investigations with dairy cattle and dairy products in Kansas] (*Kansas Sta. Bien. Rpt. 1933-34, pp. 71-85, 128, 133*).—Studies with dairy cattle yielded information on milk as a sole diet for dairy calves, influence of the ration on the vitamin C content of cows' milk, relation of phosphorus deficiency to the utilization of feed in dairy cattle, the distribution of minerals in frozen whey, relations between the composition and curd tension of milk, and mineral constituents of evaporated milk, all by H. W. Cave, W. H. Riddell, J. S. Hughes, C. H. Whitnah, and H. F. Lienhardt; grain sorghums v. corn for developing dairy heifers, corn and cob meal v. corn chop, prairie hay v. alfalfa hay, lespedeza pasture, and Wheatland milo v. corn chop for dairy cows, effect of sorghums on pregnant heifers, utilization of sorgo seed by dairy cows, and determination of the weight per cubic foot of untramped silage in a silo, all by J. B. Fitch, Cave, Riddell, and J. F. Merrill; calf feeding investigations with milk powders and semisolid buttermilk, by Riddell; dairy cattle pasture

investigations at the Fort Hays Substation; and dairy herd improvement at the Colby Substation.

With dairy products results were obtained on ice cream investigations and the influence of homogenization on the curd tension of milk, both by W. H. Martin and W. J. Caulfield; bacteriological study of ice cream, including the application of the methylene blue reduction test, by A. C. Fay; the curd character of milk, by Riddell and Caulfield; and a study of the formation, isolation, and properties of milk sugars, by Whitnah and Caulfield.

[Investigations with dairy cattle and dairy products in Oklahoma] (*Oklahoma Sta.* [*Bien.*] *Rpt. 1933–34, pp. 142–175, figs. 7*).—Experiments yielded results noted on the use of cottonseed meal in dairy rations, "cottonseed meal injury" due to vitamin deficiency, and milk production with excessive amounts of cottonseed meal, all by A. H. Kuhlman, E. Weaver, and W. D. Gallup; effects of cottonseed meal upon milk and butter quality, by J. I. Keith, Kuhlman, Weaver, and Gallup; using bean hay as a substitute for alfalfa hay for feeding milk cows, the feeding value of darso heads when used in silage, and the continued use of purebred dairy cattle sires to improve production, all by Kuhlman, P. C. McGilliard, and Weaver; methods of feeding dairy calves, by McGilliard and Kuhlman; improving the quality of Oklahoma butter, manufacturing American Cheddar cheese in Oklahoma, and ionic equilibria in ice cream mixes, all by E. L. Fouts, Keith, and Weaver; the effect of alfalfa hay on milk quality, by Weaver, Kuhlman, Fouts, and R. Reder; and the rancid flavor in milk, by Weaver, Fouts, and Reder.

[Experiments with dairy cattle in Oregon] (*Oregon Sta. Bul. 334 (1934), pp. 30, 34, 55, 70, 71*).—Tests with dairy cattle yielded information on the calcium and inorganic phosphorus content of the blood plasma of dairy cattle, and the yield and composition of Ladino clover pasture clippings, both by J. R. Haag and I. R. Jones; the hemoglobin content of cow's blood, by Haag, Jones, and R. E. Brooke; irrigated pastures for dairy cows; dry calf meal; biochemical and nutritional problems of alfalfa hay; chemical composition of pastures; and the economical limits of feeding grain with alfalfa hay at the Umatilla Substation.

Tests in cream cooling under farm conditions showed that this practice improved butter quality.

[Investigations with dairy cattle and dairy products in Washington] (*Washington Sta. Bul. 305 (1934), pp. 29–32, 33*).—These studies yielded information on the feeding value of green stack oats and peas, by R. E. Hodgson and J. C. Knott; tests for abnormal conditions in milk, by C. C. Prouty and E. V. Ellington; the value of H-ion determination of the butter serum in the scoring of butter, by H. A. Bendixen, Prouty, and Ellington; and the rate of bacterial growth in milk pasteurized at different temperatures, by Prouty and Ellington.

Progress in research at Reymann Memorial Farms, G. A. Bowling (*West Virginia Sta. Circ. 68 (1935), pp. 20, figs. 17*).—The progress of experiments on the value of proved sires, growth of Ayrshires, feed cost of raising dairy heifers, disease control, shipping cream in cans, varieties of pastures for milk production, and pasture fertilization as conducted at the Reymann Memorial Farms are presented.

Seasonal variations in carrying capacity of pastures for dairy cows in milk, T. E. Woodward and R. R. Graves (*U. S. Dept. Agr., Tech. Bul. 465 (1934), pp. 20, figs. 8*).—The information presented in this bulletin is based on data from pasture studies at the U. S. Dairy Experiment Farm at Beltsville, Md., from 4 field stations of the Bureau of Dairy Industry, from 6 cooperating State experiment stations, from 1 station in Canada, and from 1 station in

England. In all, 19 plats of pasture grass were harvested at intervals throughout the grazing season during 1 to 4 seasons and the yield of dry matter determined. This information was translated into days of grazing for a milking cow.

Except at 2 stations in Louisiana the greatest growth of grass occurred early in the grazing season. The total yield of dry matter showed a wide variation not only with different pastures and localities but from year to year on the same pasture. The lowest yield was 710 lb. of dry matter per acre, the highest 10,124 lb., with an average of 3,486 lb. Translated into cow days of grazing these yields represented 30, 433, and 149 days, respectively. Since the growth of grass in all except a few places was not uniform throughout the grazing season, the authors point out that supplementary feeding will be necessary at some time during the period.

Corn silage feeding investigations.—The role of succulence in the dairy ration and water consumption with different rations, G. C. White and R. E. Johnson (*[Connecticut] Storrs Sta. Bul. 198 (1934), pp. 35*).—Continuing this series of investigations (E. S. R., 64, p. 675), the results of three trials are presented dealing with the role of succulence and the water consumption of lactating cows.

The inclusion of silage or water-soaked beet pulp in a grain-hay ration failed to give any appreciable or consistent advantage over a ration containing no succulence when the animals had constant access to water. The grain-hay ration produced milk at a lower feed cost than one containing succulence. When animals had free access to water the total roughage dry matter intake was not affected by the presence of succulence, but animals watered only once a day showed appreciably lower hay intake. In the latter case the addition of silage or soaked beet pulp failed to increase the intake of roughage dry matter. When water was allowed only once a day the addition of silage increased the milk yield, but not to a point where it equaled that of the no-silage group having free access to water. When such factors as milk yield were approximately equal, the water consumption was directly dependent upon the total amount of dry matter and water ingested in the feed. The amount of water drunk and the amount of water in the feed of succulent-fed animals was approximately equal to the water consumed by animals receiving no succulence. On the basis of these results, it was assumed that when water was offered free choice the addition of succulence to the ration was not economical.

The average daily water intake as drink was 111 lb. for a group receiving no succulence and watered once a day, 82.6 lb. for a group receiving succulence and watered once a day, and 136.5 lb. for a group receiving no succulence but having free access to water. The total water intake including both feed and drink was 113.4, 113.9, and 139.3 lb. in the respective groups. When they had free access to water cows drank shortly after the consumption of grain, frequently while eating hay, and in small amounts at other intervals. Between 5 a. m. and 5 p. m. 68 percent of the water intake was consumed.

The digestibility of artificially dried Sudan grass, J. A. Newlander (*Vermont Sta. Bul. 386 (1935), pp. 8, fig. 1*).—Digestion trials with two dairy cows showed that artificially dried young Sudan grass contained 9.03 percent of digestible crude protein and 58.86 percent of total digestible nutrients on the basis of 86.4 percent of dry matter. The average coefficients of digestibility were dry matter 70, crude protein 63.7, crude fiber 70.8, nitrogen-free extract 77.2, and ether extract 70.6. Mineral balances during the above trials showed losses of calcium and gains of phosphorus. These results indicate that this grass may be deficient in calcium when fed alone to dairy cows.

Lespedeza straw for dairy cows, W. B. Nevens (*Jour. Dairy Sci., 17 (1934), No. 10, pp. 671–674*).—The palatability and value for milk production of lespedeza straw as compared with soybean hay were determined in a trial with 2 groups of 9 cows each at the Illinois Experiment Station. The reversal system of feeding was followed through 2 periods of 4 weeks each. The 2 groups were fed silage and grain in addition to the straw or hay.

The lespedeza straw, which was from a crop harvested before maturity and threshed for seed, was slightly less palatable and somewhat less valuable for milk production than soybean hay harvested in the early stages of pod formation. The cows refused 23 percent of the soybean hay and 10 percent of the lespedeza straw.

The feeding value and nutritive properties of citrus by-products.—I, The digestible nutrients of dried grapefruit and orange cannery refuses, and the feeding value of the grapefruit refuse for growing heifers, W. M. Neal, R. B. Becker, and P. T. D. Arnold (*Florida Sta. Bul. 275 (1935), pp. 26, fig. 1*).—In these studies it was found that dried grapefruit cannery refuse and dried orange peel were palatable to cattle. The citrus byproducts were low in crude protein, fiber, and fat, but high in nitrogen-free extract which was 88 to 92 percent digestible. The grapefruit and orange refuse contained 82.8 and 80.8 lb., respectively, of total digestible nutrients per 100 lb. of dry matter. Digestion trials showed these products to rank high as carbohydrate concentrates. These byproducts had a laxative effect when fed as a large part of the ration. The animals fed dried grapefruit refuse were thrifty in appearance, had glossy hair coats, and were thick fleshed.

The effect of feeding raw rock phosphate on the fluorine content of the organs and tissues of dairy cows, C. Y. Chang, P. H. Phillips, E. B. Hart, and G. Bohstedt (*Jour. Dairy Sci., 17 (1934), No. 10, pp. 695–700*).—A series of fluorine determinations was made at the Wisconsin Experiment Station on the tissues and organs of dairy cows fed various levels of raw rock phosphate containing 3.5 percent of fluorine. This work was undertaken to determine the distribution and storage of fluorine in farm animals.

Fluorine was found in the normal tissues studied, and the greatest quantities accompanied calcium and phosphorus deposition. Thus the bones and teeth showed large amounts of fluorine, while such organs as the liver, kidney, heart muscle, and other tissues examined contained only small quantities. The average normal fluorine content of normal dentine and normal bone lay between 42 and 63 mg per 100 g of dried tissue. The average fluorine content of the liver, kidney, heart muscle, pancreas, thyroid, tendons, hair, and hoof was less than 1 mg per 100 g of dried normal tissue. Including 0.088 percent of fluorine in the grain ration increased the fluorine storage in the bones and teeth from 16 to 25 times that found in normal osseous tissue. The same amount of added fluorine doubled the fluorine content of the internal organs, tendons, and hair.

The relative efficiencies of irradiated ergosterol and irradiated yeast for the production of vitamin-D milk, W. E. Krauss, R. M. Bethke, and W. Wilder (*Jour. Dairy Sci., 17 (1934), No. 10, pp. 685–693*).—The relative efficiencies of irradiated ergosterol and irradiated yeast for increasing the vitamin D content of milk were investigated at the Ohio Experiment Station (E. S. R., 68, p. 663). Four groups of three Holstein cows each were used in this work. Two groups received 60,000 rat units of vitamin D in the form of either irradiated ergosterol or irradiated yeast daily, while the other two groups received 120,000 rat units of vitamin D daily from the same sources.

An assay of the milk produced showed that irradiated ergosterol was approximately two-thirds as efficient as irradiated yeast in the transfer of vitamin

D to the milk. The difference could not be attributed to variations in absorption from the intestinal tract, since the vitamin D content of the feces and the blood was the same regardless of which suppplement was fed. It is thought that vitamin D may exist in different forms, or that there was a difference in the "disappearance" of vitamin D from the two sources into the tissues.

A score card for production records of dairy cows, C. E. WYLIE (*Tenn. Univ. Mimeogr. Rpt. 13 (1934), pp. 10*).—A score card is presented, the purpose of which is to standardize all milk records on the basis of (1) mature animals, (2) for 1 yr., (3) milked three or more times daily, and (4) producing a living calf.

Methods of sampling milk, D. H. BAILEY (*Pennsylvania Sta. Bul. 310 (1934), pp. 30, figs. 3*).—In this experiment records were taken at one plant over a 2-yr. period to study the milk sampling problem of the buyer and seller.

The milk of 19 patrons of the plant did not mix adequately when dumped at the plant. With such milk the lowest test occurred at the dump or front end of the weigh tank 90 percent of the time. This inadequate mixing of the milk was due to the formation of a very low-testing pool of milk in the weigh tank, caused by the dumping of exhaustively creamed-off milk. The lower half of such cans contained milk serum with a fat content of 0.3 to 0.9 percent which fell from the can last and formed the pool. The exhaustive creaming occurred when fresh warm milk was placed in water below 50° F. and cooled quickly without agitation.

Stirring creamed-off milk in cans before dumping and a mechanical agitator in the weigh tank insured accurate samples. Dumping milk that had been slowly cooled, and which had formed a thick cream layer, into strainer boxes with fine-mesh screens that became immersed in the dumped milk often resulted in the cream remaining in the strainer box until the milk was out of the tank and caused inaccurate samples. Agitating such milk in the can before dumping overcame this difficulty.

The influence of homogenization on the soft curd character of milk, W. J. CAULFIELD and W. H. MARTIN (*Milk Plant Mo., 23 (1934), No. 12, pp. 24–29*).—This investigation at the Kansas Experiment Station was planned to determine the influence of homogenization on the curd tension of whole milk. Milks with low, medium, and high curd tensions and butterfat contents of 4.2, 4.9, and 5.9 percent, respectively, were selected. Each type of milk was homogenized at 120°, 145°, and 165° F., using 0, 1,500, 2,500, and 3,500 lb. pressure per square inch, respectively.

The data obtained showed that homogenization reduced the curd tension of the milk. The reduction in curd tension due to the processing was more dependent upon the initial curd character than upon any other factor studied. It was possible to produce soft-curd milk from whole milk with an initial curd tension of 62 g irrespective of the temperature or pressure used.

A greater total reduction in curd tension was obtained at the 165° processing temperature than at 120° or 145°. This was due to the combined effects of the heat treatment and homogenization. Pressures of more than 2,500 lb. appeared to have little practical value in reducing curd tension. Rehomogenization did not materially change the curd tension of homogenized milk. The change produced by homogenization appeared to be permanent. Pasteurizing at 145° for 30 min. or at 165° momentarily prevented the development of rancid flavor, but such flavor developed in raw milk homogenized at 2,500 lb. at 100° within 2 hr. of processing.

Burnt or caramel flavour in milk and its products, R. H. LEITCH (*Scot. Jour. Agr., 17 (1934), No. 3, pp. 293–296*).—In this article from the West of Scotland Agricultural College the author describes an outbreak of a strong, dis-

agreeable burnt smell in cheese curd made at the experiment station. This condition was traced to the milk of certain cows. The causal organism, except that it was somewhat larger than the ordinary lactic acid organism commonly found in milk could not be differentiated by any morphological or cultural characteristics from *Streptococcus lactis* except for its property for imparting burnt flavor. Control measures are suggested.

The effect of the wrapping material on the fat of fatty foods.—I, Contact wrappers, vegetable parchment, greaseproof paper, W. L. DAVIES (*Jour. Soc. Chem. Indus., Trans., 53 (1934), No. 17, pp. 117T–120T, fig. 1*).—Samples of hard neutral vegetable parchment from British and continental sources were found by the National Institute for Research in Dairying to contain on the average 22 p. p. m. of copper and 50 p. p. m. of iron. Practically the entire source of these minerals was the wood cellulose pulp from which the parchment was made. Loaded vegetable parchment and greaseproof paper contained much higher amounts of the metals. The water solubility of the metals varied at different pH values.

The rate of autoxidation of butterfat as a thin film on finely ground paper of the above type was not appreciably greater than that of butterfat on ground sulfite cellulose pulp or glass wool, and was less than that of butterfat on cotton wool. It is concluded that the effect of these metals was not appreciable within the range of acidities met in fatty foods or during the period in which such foods are stored in wrappers.

Methods of cooling and storing cream for Oregon's dairy farms: Influence on the quality of butter which can be manufactured, G. H. WILSTER, H. HOFFMANN, and P. M. BRANDT (*Oregon Sta. Bul. 326 (1934), pp. 29, figs. 4*).—This study was undertaken to determine the conditions under which cream could be kept on farms in order that 92-score butter could be made from it at the creameries.

Of the various methods studied, that of placing a 5-gal. can of cream with an initial temperature of 90° F. in a tank of flowing water having a temperature ranging from 47° to 54° was the most satisfactory for maintaining the quality of the cream. The score of butter made from such cream averaged 2 points higher than that made from cream cooled by air and stored at air temperature when this ranged from 44° to 86° and the mean daily temperature ranged from 53° to 77°. It also averaged 1 point higher than the score of butter made from cream cooled and stored in a tank of still water with the water changed twice daily and having an initial temperature of from 47° to 60°. Quick cooling of cream with a special water cooler using water with an initial temperature of 47° to 60°, followed by storing at air temperature, maintained the flavor better than cooling and storing at air temperature. Precooling in the above manner followed by storage in either still or running water was of no additional benefit.

The scores of butter that could be made from creams cooled and stored in different ways are given.

Fat rising in cream, H. C. TRELOGAN and W. B. COMBS (*Jour. Dairy Sci., 17 (1934), No. 10, pp. 675–684*).—The Minnesota Experiment Station undertook a study of the extent to which butterfat tends to rise in cream.

The tendency of butterfat in cream to rise and concentrate in the upper portions was similar to cream rising in milk. The rapidity with which butterfat rose decreased as the butterfat content increased. Holding cream at low temperatures reduced the amount and rapidity of fat rising. Pasteurization appeared to increase slightly the extent of fat rising. The amount of fat rising

was not appreciably affected by standardizing cream with skim milk. Low fat contents and high holding temperatures tended to increase plasma separation.

The color imparted to coffee by cream treated in various ways, R. Whitaker (*Jour. Dairy Sci., 17 (1934), No. 10, pp. 651–658*).—This investigation was undertaken to determine the reasons for the variations in creams as to coloring coffee. A test was developed for evaluating creams in this respect.

The amount of cream required to impart a given color decreased as the fat content increased, as the milk solids-not-fat content increased, and when the cream was homogenized. The usual method of pasteurizing cream had no influence on the color of the coffee-cream mixtures, but flash pasteurization slightly reduced the amount of cream necessary to produce the required color. Cream given a slight heat treatment to increase its viscosity did not color coffee as well as the same cream untreated. Aging and the development of slight acidity had no influence on the quantity of cream required to color coffee.

VETERINARY MEDICINE

[Report of work in animal pathology and parasitology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 112–116, 117, 118*).—The work of the biennium referred to (E. S. R., 69, p. 265) includes investigations of the use of ovarian extract in functional sterility, by R. R. Dykstra, H. F. Lienhardt, E. R. Frank, and E. G. Leasure; combating abortion disease, by Lienhardt and C. H. Kitselman; shipping fever, including bacteriological studies of *Pasteurella boviseptica*, by Dykstra, J. P. Scott, and H. Farley; anaplasmosis, by Dykstra, C. A. Pyle, and Lienhardt; infectious laryngotracheitis (E. S. R., 72, p. 258), by Lienhardt and Scott; and the control and the resistance of chickens to intestinal nematodes (*Ascaridia lineata* Schneid.), by J. E. Ackert.

[Report of work in animal pathology by the Nevada Station] (*Nevada Sta. Rpt. 1934, pp. 25, 26, 31, 32, 33, figs. 2*).—The work of the year briefly reported upon (E. S. R., 71, p. 526) relates to poisonous range plants, including mountain-laurel (*Kalmia microphylla*), *Hymenoxys lemmoni*, and poisonous parsnip (*Cicuta occidentalis*), by C. E. Fleming, M. R. Miller, L. R. Vawter, and A. Young, and hemorrhagic disease of cattle and encephalomyelitis of equines, both by E. Records and Vawter.

[Report of work in animal pathology by the Oregon Station] (*Oregon Sta. Bul. 334 (1934), pp. 30, 33, 44–46*).—The work of the biennium 1933–34 (E. S. R., 64, p. 377) referred to includes that with bovine infectious abortion, avian coccidiosis, fowl pox, mastitis, lungworms, liver flukes, a reindeer parasite in an Oregon deer, and salmon poisoning of dogs.

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk., 65 (1932), Nos. 1, pp. 1–101, figs. 9; 2, pp. 105–197, figs. 19; 3, pp. 201–305, figs. 23; 4, pp. 307–411, figs. 18; 5, pp. 413–533, figs. 24; 6, pp. 535–638, pl. 1, figs. 34*).—The contributions presented (E. S. R., 70, p. 826) include the following: The Blood Pressure of Horses with Temperatures Higher than 39° C. [102° F.], by W. Rüscher and M. Sonntag (pp. 1–45); Further Contributions to the Knowledge of the Transmissible Leucosis of the Fowl, by K. Jármai, T. Stenszky, and L. Farkas (pp. 46–71) (E. S. R., 69, p. 710); Methods of Investigation of the Liver Fluke *Fasciola hepatica*, by P. J. Popow (pp. 72–74); Investigations of the Foot-and-Mouth Disease Virus in Austria, by S. v. László (pp. 75–82); Experiments and Observations on Dairy Cows in the Course of Streptococcic Mastitis Investigations—III, A Contribution to the Successful Treatment of Streptococcus Infection of the Udder with Rivanol, by M. Seelemann (pp. 83–93) (E. S. R., 70, p. 828); Experimental Differentiation of the Causative Organism of Symptomatic Anthrax and of Parasymptomatic Anthrax

of Cattle and Sheep, by K. L. Wolters (pp. 94–99); Striated Muscle Fibers in the Thyroid of the Horse, by A. Zimmermann (pp. 100, 101); The Presence of the Hog Cholera Virus in the Lymph Nodes after Infection of Swine, by R. Manninger and J. Csontos (pp. 105–116); The Pathological Anatomy of Paratyphoid in Cattle, by A. Hemmert-Halswick (pp. 117–139); The Nervous System in A-avitminosis of the Fowl, by O. Seifried (pp. 140–156); The Origin of Vesicular Respiration: A Reply to the Contribution of Mócsy, by A. Winkler (pp. 157–173) (E. S. R., 69, p. 580); The Action of the Lymph Nodes in the Early Generalization of Tuberculosis, by K. Nieberle (pp. 174–178); Some Actual Problems in Hog Cholera Control: Remarks on the Contribution of Michalka on Simultaneous Vaccination, by L. Detre (pp. 179–184) (E. S. R., 70, p. 92); Critical Remarks on the Work of Detre: Some Actual Problems in Hog Cholera Control (above), also Remarks on the Contribution of Michalka (E. S. R., 70, p. 92), by J. Michalka (pp. 185–187); Alterations of the Leucocyte Content of the Blood in Coccidiosis of the Rabbit, by W. L. Yakimoff and P. S. Iwanoff-Gobzem (pp. 188–194); Tuberculinization of Cattle by Injection through the Lachrymal Duct, by U. Lockau (pp. 195–197); The Synthetic Constitution of the Newer Anthelmintics and Their Pharmacological Evaluation: A Contribution to the Knowledge of the Relation between Chemical Constitution and Vermifuge Action in the Santonin Group—II, Pharmacological Part, by A. Gluschke (pp. 201–243) (E. S. R., 70, p. 827); The Susceptibility of Different Species of Birds to Infection with the Unaltered Virus of Fowl Pox and of Pigeon Pox, by G. Tietz (pp. 244–255); The Relation of Newcastle Disease to Fowl Pest, also a Contribution to the Question of the Plurality of the Filtrable Virus Causes, by R. Manninger (pp. 256–265); Comparative Pathology of the Skin, I, by J. Jost (pp. 266–271); The Problem of Functional Diagnosis of Heart Conditions, by A. P. Alatorzeff (pp. 272–278); The Relation between Tumor Growth and the Amino-acid Content of the Blood, by S. L. Malowan (pp. 279–284); Further Contributions to the Pharmacology of the Isolated Bovine Uterus—Novocaine, by H. Graf and H. Paschke (pp. 285–293) (E. S. R., 69, p. 710); A Contribution to the Prevention and Control of Ectoparasites of Birds, Particularly the Fowl, by Seidel (pp. 294–305); The Occurrence of Pox in Canaries, Bullfinches, and Sparrows, by E. Eberbeck and W. Kayser (pp. 307–310); Comparative Pathology of the Skin, II (pp. 311–314) and III (pp. 315–319), both by J. Jost (see above); Studies of the Wattle Tuberculin Test in the Fowl, by R. Helm (pp. 320–330); Investigations of the Etiology of Grass Tetany—I, Absorption, Metabolism, and Excretion of Potassium Nitrate Given in Solution to Cattle (The Composition of the Blood in Nitrate Poisoning), by L. Seekles and B. Sjollema (pp. 331–343); A Contribution on the Infection of Rabbits with *Bacterium enteritidis breslaviense*, by J. Witte (pp. 344–352); Light Deficiency Diseases: The Action and Importance of Lamps Emitting Ultraviolet Rays, Combined with a Screen Which Distributes the Light, by R. Walter (pp. 353–359); Acute Lead Poisoning in Cows and Calves, by R. Haltenhoff (pp. 360–370); A Contribution to the Histology of the Normal Lung Acinus of the Bovine, by H. Baumgärtner (pp. 371–377); Experiments with the Hog Cholera Virus, by J. Köves and Z. Hegyeli (pp. 378–411); The Action of Eutonon on the Heart, Respiration, and Blood Pressure of Normal and Diseased Horses, by K. E. Stump (pp. 412–439); Further Investigations of the Infectivity of Swine after Inoculation with Hog Cholera Virus, by R. Manninger and S. v. Lászlò (pp. 440–447); The Hog Cholera Virus Carrier after the Natural Disease and after Serum Simultaneous Vaccination, by Z. Hegyeli (pp. 448–450); The Serological Diagnosis of Equine Infectious Anemia of the Horse, by J. v. Mócsy (pp. 451–459); The Functions of the Kidney as Shown by the Urea in the Blood of Horses Affected

with Enzootic Hemoglobinemia and with Myoglobinemia (Hemoglobinemia) Paralytica, by A. Laas (pp. 460–474); A Test of Electroionic Therapy in Fistulous Withers of the Horse, by A. S. Postnikoff and A. Wischnjakoff (pp. 475–479); The Isoagglutination Test of the Blood as a Means of Prevention of Hemolysis in Horses, by W. R. Kuhn (pp. 480–489); Deficiency Diseases of Domestic Animals Due to Lack of Mineral Elements, by J. Wester (pp. 490–521); Experiments and Observations on Dairy Cows in the Course of Streptococcic Mastitis Investigations—IV, Successful Transmission by Wet Milking, by M. Seelemann and K. Siemonsen (pp. 522–533) (see above); Udder Infection and the Influence of Stripping on the Course of Streptococcus Mastitis—II, Machine Milking, by F. Schmidt-Hoensdorf and W. Schmidt (pp. 535–546) (E. S. R., 70, p. 92); The Pathogenesis of Equine Infectious Anemia, by J. v. Mócsy (pp. 547–558); Observations of a Goat Fed a Normal Vegetable Diet, but not Ruminating, and a Contribution to the Physiology of Ruminants, by A. Trautmann and J. Schmitt (pp. 559–573); Errors in the Measurement of Blood Pressure of Horses with the Tonoscillograph and Ring Compressor of Piesch, by K. Neumann-Kleinpaul, H. Steffan, and E. Zieger (pp. 574–594); Contribution to the Knowledge of the Common Tapeworm of the Fowl *Davainea proglottina*, by R. Wetzel (pp. 595–625); The Ciliary Muscle of the Horse, by A. Zimmermann (pp. 626–628); and The Graphic Registration of Heart Sounds in Man and Animals, by K. Neumann-Kleinpaul and H. Steffan (pp. 629–638).

[Report of work with livestock diseases in the Union of South Africa], P. R. VILJOEN (*Farming in So. Africa, 9 (1934), No. 105, pp. 505–507*).—A brief account is given in this annual report for the year ended August 31, 1934, of the occurrence of and control work with diseases of livestock, particularly scab of sheep and goats, East Coast fever, foot-and-mouth disease, and hog cholera.

***The life cycle of Fascioloides* magna *(Bassi 1875), the large liver fluke of ruminants, in Canada, with observations on the bionomics of the larval stages and the intermediate hosts, pathology of Fascioloidiasis* magna, and control measures,** W. E. SWALES (*Canad. Jour. Res., 12 (1935), No. 2, pp. 177–215, pls. 5, figs. 24*).—The author finds the two fresh-water gastropods *Fossaria parva* (Lea) and *Stagnicola palustris nuttalliana* (Lea) to serve as intermediate hosts of *Fascioloides magna* in Canada, where the life history of this fluke has been worked out. The morphology and biology of the egg and larval stages are described, particular attention being given to the nonparasitic stages. The ecology of the gastropod hosts in Canada is briefly described.

"A histopathological study of the lesion in definitive hosts reveals that this parasite in large Bovidae causes a severe tissue reaction. The lesion in these animals is generally in the form of a closed fibrous cyst from which eggs are unable to pass, and thus the life cycle cannot be completed. In Cervidae, the cavity in the liver is connected directly with the bile duct system, and there is a free egress of ova. From these facts it is inferred that this parasitic disease can only occur in the presence of Cervidae. Laboratory animals have been artificially infested with maritae, thus extending the host records of the trematode.

"A brief historical review, a summary of the present knowledge of distribution and definitive hosts affected, and a description of the control measures are included."

A list of 30 references to the literature is included.

Psilostrophe tagetinae and Psilostrophe gnaphalodes, two plants poisonous to sheep and cattle on the ranges of the Southwest, F. P. MATHEWS

(*Texas Sta. Bul. 500* (*1934*), *pp. 18*, *fig. 1*).—The author, working in cooperation with the U. S. D. A. Bureau of Animal Industry, has found *P. tagetinae* and *P. gnaphalodes*, which occur over a large area of west Texas, to be poisonous to sheep. Botanical descriptions are given, together with their exact distribution so far as known.

Poisoning resulting from eating these plants manifests itself in about 3 weeks by general malaise, weakness in the legs as evidenced by stumbling when running, regurgitation of food as indicated by a greenish staining of the lips, and finally death. Old plants (blooming stage) were found to be less toxic than younger plants. No remedy is known. As a rule these plants were generally confined to certain pastures. By rotating sheep from infested to noninfested pastures serious losses were prevented.

Psilocaulon absimile N. E. Br. as a stock poison.—II, Isolation of the toxic alkaloidal constituent and its identification as piperidine hydrochloride, C. Rimington (*So. African Jour. Sci.*, *31* (*1934*), *pp. 184–193*, *figs. 7*).—This is a continuation of the studies previously noted (E. S. R., 70, p. 828).

Investigations into the nature of the gelatin-melting enzymes formed by the gas-gangrene bacteria: The importance of the degree of acidity of the medium for the action of the enzymes, L. E. Walbum and G. C. Reymann (*Jour. Path. and Bact.*, *39* (*1934*), *No. 3*, *pp. 669–679*, *figs. 7*).—Examination was made of the importance of the H-ion concentration for the action of the gelatin-melting enzymes occurring in culture filtrates of *Clostridium welchii*, *Bacillus oedematis maligni* (*Vibrion septique*), *B. novyi* (*oedematiens*), *B. histolyticus*, *B. sporogenes*, lamb dysentery bacillus, and *B. tetani*.

"For the enzymes produced by *C. welchii* and *B. histolyticus* two pronounced action optima exist, one about pH 6 and the other around pH 8–9, with an interjacent minimum in the neighborhood of pH 7–7.5. For the other five enzymes examined an action optimum around pH 7–8 has been ascertained."

Report of Committee on Bang's disease, C. P. Fitch et al. (*Jour. Amer. Vet. Med. Assoc.*, *86* (*1935*), *No. 3*, *pp. 311*, *312*).—The brief report of this committee of the United States Livestock Sanitary Association is supplemented by a symposium on Bang's disease contributed to by authors from 32 States (pp. 312–341).

***A study of various fractions of* Brucella abortus, IV–VI,** R. Gwatkin (*Canad. Jour. Res.*, *12* (*1935*), *No. 2*, *pp. 147–164*).—These further studies (E. S. R., 72, p. 838) deal with residues from whole filtrate and after removal of alcoholic precipitate, alcoholic precipitates prepared from a dissociated strain of *B. abortus* and from *Escherichia coli* and *B. subtilis*, and extract of dried and ground organisms.

Carbohydrate and nucleoprotein fractions isolated from the Brucella group, L. E. Topping (*Jour. Path. and Bact.*, *39* (*1934*), *No. 3*, *pp. 665–668*).—The author has found that the product that precipitates with both *B. abortus* and *B. melitensis* antisera is practically protein free and gives the reactions of a polysaccharide. Thus far it has not been possible to show any differences between the carbohydrates of *B. abortus* and *B. melitensis*. A brief reference is made to the finding by Huddleson of two polysaccharides in *Brucella* (E. S. R., 71, p. 241; 72, p. 382).

The spontaneous occurrence of Brucella agglutinins in dogs, W. H. Feldman, F. C. Mann, and C. Olson, Jr. (*Jour. Infect. Diseases*, *56* (*1935*), *No. 1*, *pp. 55–63*).—The authors found specific agglutinins against *Brucella* to be present in the serums of some 104 ... living on farms. It was found that dogs p... *rtus* usually exhibit no evidence of illness, ...s are not likely to be demonstrable. There ... agglutinins against

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Brucella in the serums of dogs and the presence within the tissues of viable, virulent bacteria of the *Brucella* group. Although the dissemination of infection with *Brucella* from dogs whose serums possess agglutinins against *Brucella* is worthy of consideration, such dissemination appears unlikely.

The influence of bovine serum on Brucella infection in guinea pigs, R. A. BEACH (*Jour. Infect. Diseases, 56 (1935), No. 1, pp. 38–40*).—In work at the Wisconsin Experiment Station the administration of bovine serum showing bactericidal power to guinea pigs either subcutaneously or intra-abdominally retarded *Brucella* infection as compared with the controls. The results indicate that unless some method is found of increasing the protective power of cow serum that it will probably be of little practical value in combating *Brucella* infections.

The pathogenicity for cattle of Brucella strains isolated from cases of undulant fever in man, R. R. BIRCH and H. L. GILMAN (*Jour. Infect. Diseases, 56 (1935), No. 1, pp. 78–83*).—In work at Cornell University *Brucella* strains isolated from typical cases of undulant fever in man proved regularly to be pathogenic for cattle, producing in them a syndrome indistinguishable from that which occurs in natural cases of *Brucella* infection otherwise known as infectious abortion or Bang's disease.

A survey of workers in packing plants for evidence of Brucella infection, L. S. HEATHMAN (*Jour. Infect. Diseases, 55 (1934), No. 3, pp. 243–265, figs. 3*).—The author reports upon an investigation of 1,096 men employed in five of the larger packing plants in Minnesota, in four of which plants a number of frank and suspected cases of undulant fever had occurred.

It was found in a group of workers who had no contact with animals or animal products that the incidence of agglutinins, 1.3 percent, was far lower than has been reported by the majority of writers for general population groups. The findings in the study, together with observations on the incidence of the allergic state in healthy individuals without history of undulant fever or known exposure to *Brucella* infection, led to the conclusion that the intradermal test is of little value as a diagnostic aid.

Serologic relationship of Brucella and Pasteurella, L. E. STARR and G. E. SNIDER (*Jour. Infect. Diseases, 55 (1934), No. 3, pp. 384–389*).—The experiment reported in this contribution from the Virginia Experiment Station was conducted with a view to determining the relationship, if any, of cross agglutination, inactivation of serum, injection of biologic products, and the feeding and injection of live cultures of *Pasteurella* to reactions positive for *Brucella*.

In the course of the work, "cross agglutination between the groups of *Brucella* and *Pasteurella* was demonstrated with 96 samples of cattle serum. Except for minor variations, serums of low titer agglutinated both antigens equally well. Strongly positive serums, however, showed higher end titers with *Brucella* than with *Pasteurella*. Inactivated serums gave reactions that did not vary appreciably in titer from those obtained with unheated serums. The injection of commercial biologic products commonly used for the prevention and treatment of hemorrhagic septicemia did not result in the production of agglutinins demonstrable with *Brucella* as antigen. Feeding of live growths of *Pasteurella* to 3 calves did not result in the production of demonstrable agglutinins for *Brucella*. Negative results were also obtained following the intravenous injection of live growths of *Pasteurella* into 2 calves. Agglutinins were detected in the serum of 1 of 2 calves treated subcutaneously with a live culture."

Tularemia in a wild grey fox (report of a case), C. F. SCHLOTTHAUER, C. OLSON, JR., and L. THOMPSON (*Mayo Found. Med. Ed. and Res., Proc. Staff Meetings Mayo Clinic, 9 (1934), No. 1, pp. 12–16*).—A report is made of the

gross and miscroscopic finding in a diseased wild gray fox taken at Plainview, Minn., on December 16, 1933. It was determined through inoculation that *Pasteurella tularensis* was the cause of the condition. This is thought to be the first recorded occurrence of tularemia in the wild gray fox.

Tularemia in wild gray foxes: Report of an epizootic, C. F. SCHLOTTHAUER, L. THOMPSON, and C. OLSON, JR. (*Jour. Infect. Diseases, 56 (1935), No. 1, pp. 28–30*).—In observations in Minnesota, conducted in continuation of those above noted, in which *Pasteurella tularensis* was definitely isolated from 4 of 10 wild gray foxes (*Urocyon cinereo-argentatus*) studied, the findings indicate that this fox is susceptible to tularemia and that fatal infections may occur in nature. It is considered quite possible that the epizootic of fatal disease observed in wild gray foxes in southeastern Minnesota in 1933 and 1934 was tularemia. No sick or dead red foxes were observed.

Experimental behavior of the virus of exanthematous typhus of São Paulo after passage through the cayenne tick Amblyomma cajennense [trans. title], J. LEMOS MONTEIRO (*Mem. Inst. Butantan, 8 (1933–34), pp. 21–37, pl. 1, figs. 12; Eng. abs., p. 36*).—The virus of spotted fever in São Paulo keeps all of its fundamental characters after passage through *A. cajennense*, judged by its experimental behavior and immunological relationships.

The diagnosis of agalactiosis, W. STECK (*Cornell Vet., 25 (1935), No. 1, pp. 6–21*).—In this contribution, presented with a list of 35 references to the literature, various methods leading to the diagnosis of *Streptococcus agalactiae* mastitis (agalactiosis) are discussed and an attempt is made to determine the limits of their efficacy.

It is concluded that the microscopic examination of the sediment will usually give a positive result if the number of streptococci exceeds 2,000 per cubic centimeter. A sediment smear on an agar plate will give a positive result when the number of streptococci in whole milk exceeds 10 per cubic centimeter. "In the eradication of agalactiosis the use of cultural examination is inevitable, whereas chemical indirect methods play only a secondary part. A simple and accurate technic for the detection of *S. agalactiae* is described, which consists mainly in adding 0.5 cc of the whole milk to serum-dextrose agar in high narrow tubes. Incomplete mixing before cooling replaces the use of further dilutions. The cultures are inspected mainly after about 12 hr., when hardly any but streptococcic colonies are visible. For further biochemic determination, agar slopes with Klimmer's medium and various fermentable substances are used."

A new method for the eradication of Streptococcus agalactiae mastitis in a herd, W. STECK (*Cornell Vet., 25 (1935), No. 1, pp. 1–5*).—This contribution, presented at the Twelfth International Veterinary Congress in August 1934, reports upon the main results of investigations on the chemotherapy of *S. agalactiae* mastitis (agalactiosis) carried out in the years 1929 to 1934.

"Trypaflavine appeared superior to Rivanol, Entozon, and Uberasan. The lowest portions of the milk gland, i. e., teat and gland portion of the milk cistern, appear to be the stronghold of the infection. A method is described which consists mainly in the application of a much more concentrated solution for the lowest portion of the gland. The results obtained so far with this method encourage further application and test."

The microscopic diagnosis of infectious mastitis, C. S. BRYAN (*Vet. Med., 30 (1935), No. 4, pp. 149–155, fig. 1*).—In this contribution from the Michigan Experiment Station a rapid, convenient, and accurate method for the diagnosis of infectious mastitis is described. The results of hourly examinations of milk samples during incubation, of examination of milk samples over a period of 6 mo., from mastitis-free and mastitis-infected cows, of milk samples from

mastitis-free cows at the time of freshening as compared to their normal, and of milk from mastitis-free cows that suffered traumatic injury during the course of this study are reported in detail in tabular form.

Infectious bovine mastitis.—III, Methods of control, W. N. Plastridge, E. O. Anderson, G. C. White, and L. F. Rettger ([*Connecticut*] *Storrs Sta. Bul. 197* (*1934*), *pp. 40, figs. 6*).—This third contribution, which relates to methods of control (E. S. R., 72, p. 256), presents a review of past work in connection with a list of 31 references to the literature, describes experimental methods employed, and reports upon the influence of bacterin (killed organism) on the incidence of chronic mastitis. Data on the annual incidence of mastitis in bacterin treated and untreated animals in five herds are presented, the details being given in table and chart form.

In herd C, the college herd, the average incidence of mastitis for a 4-yr. period was 40.5 percent in the treated group and 51.2 percent in the untreated group. In herd B the incidence of mastitis in the bacterin-treated group was 50.0 percent during the first year and 40.9 percent during the second year. The control group showed an incidence of 40.0 percent during the first year and 39.1 percent during the second year. Bacterin was used in herd F for 2 yr. and then discontinued. Segregation and disposal of affected animals and sanitary control measures were then practiced. The incidence of mastitis during the first and second year was 33.3 and 29.4 percent, respectively. During the third year it dropped to 16.6 percent, and to 3.8 percent at the beginning of the fourth year. In herd O the incidence of mastitis decreased from 50.0 percent to 4.0 percent over a 3-yr. period. All animals in this herd received bacterin during the first year only, but it is deemed impossible to ascribe the improvement in the early period entirely to bacterin, as 4 of the 9 affected animals were sold, as compared with 5 which recovered. In herd G the incidence of chronic mastitis was 66.7, 85.0, 56.3, 48.4, and 51.5 percent in the first, second, third, fourth, and fifth years of observation. During the first 4 yr. animals received autogenous herd bacterin. When bacterin treatment was discontinued and a program of segregation and disposal of affected animals adopted near the end of the fifth year, the incidence was reduced to 34.3 percent within a period of less than a year.

"In general, the results obtained with bacterins show that (1) periodic injections of autogenous herd bacterins fail to bring about complete recovery of affected animals; (2) they reduce but slightly the rate of spread of infectious mastitis; and (3) they apparently aid somewhat in retarding the occurrence of milk abnormal in appearance by animals recently affected with the disease.

"Evidence of recovery was no greater in treated than in untreated animals and was limited almost entirely to those affected with staphylococcal mastitis or mastitis due to infection with group B streptococci. Instances of recovery in animals affected with mastitis due to group A streptococci (which appears to be the principal cause of mastitis in Connecticut herds) were rare.

"Determination of the relation of the lactation period to evidence of mastitis in two badly affected herds showed that the incidence of laboratory evidence of mastitis, shedding of streptococci and yielding of milk abnormal in appearance, increased at a fairly uniform rate with each succeeding lactation period. First-calf heifers were usually free from mastitis for several months following parturition. Thereafter, the incidence of mastitis increased steadily until all animals that reached the ninth lactation period gave consistently positive evidence of mastitis by laboratory tests and yielded milk abnormal in appearance at irregular intervals. The laboratory tests employed detected evidence

of mastitis several months sooner than it was revealed by the macroscopic appearance of the milk alone.

"In two groups of heifers which were given periodic injections of bacterin, one group beginning shortly before and the other shortly after calving, the incidence of mastitis was 6.3 percent in the first lactation period as compared with 20.0 percent in the control group. In the second and third lactation periods the incidence of mastitis increased as rapidly in the treated groups as in the control group."

A plan for the control of infectious chronic bovine mastitis by use of periodic laboratory examination, segregation of animals, and general sanitation is described.

Haemorrhagic filariasis in cattle caused by a new species of Parafilaria, Z. DE JESUS (*Philippine Jour. Sci., 55 (1934), No. 2, pp. 125–131, pl. 1, fig. 1*).—An unusual case of parasitism in cattle characterized by profuse local hemorrhages from slightly raised nodules observed by the author in July 1932 in Tanauan, Batangas, is reported upon. The parasite *P. bovicola* Tubangui is said to be responsible for the condition.

The problem of caprine Brucella infections in the United States, K. F. MEYER and B. EDDIE (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 3, pp. 286–303*).—Following a review of records of the occurrence of undulant fever in the southwest of the United States, the authors report upon a study of infection in the goat. The preliminary investigations are considered to have progressed far enough to warrant the combined application of the allergic serologic tests It is pointed out that public health authorities should demand that goat milk dairies consist of animals which give negative skin, blood, and whey tests. Further, the time has arrived when efforts should be made to prevent the interstate shipment of goats reacting to the skin tests.

In vaccination experiments conducted it was found that a previons infection with *B. suis* or nonvirulent *B. abortus* through ingestion or by injection in at least two instances failed to protect the goat from abortion or specific endometritis, metastatic localization in the lymph nodes when the animals were reinfected with an American *B. melitensis* strain. It is thought that perhaps the only difference between the supposedly protected goats and the controls was the constancy with which *B. melitensis* organisms were absent from the blood cultures in the previously treated animals. By contrast, the immune goats invariably gave negative blood cultures, but the genital localization and latency of the *B. melitensis* organism differed in no way from those seen in the nontreated goats. In the animals injected with nonvirulent *B. abortus* even the blood cultures remained positive. The histories of three cases in man are briefly reported. A list is given of 66 references to the literature.

Chronic copper poisoning in sheep, I. B. BOUGHTON and W. T. HARDY (*Texas Sta. Bul. 499 (1934), pp. 32, figs. 5*).—Studies conducted have shown that the so-called "icterohemoglobinuria", as it has occurred on numerous ranches in the Edwards Plateau region of west Texas in the past few years, is in reality chronic copper poisoning. This condition, characterized clinically by generalised icterus, hemoglobinuria and hematuria, inappetence, and extreme weakness, has been found to result from the long-continued ingestion of commercial salt mixtures which contain relatively small percentages of copper sulfate in addition to sodium chloride and tobacco dust. Analysis of two of these commercial mixtures fed on ranches where the disease occurred showed powdered copper sulfate ($CuSO_4.5H_2O$) in amounts varying from 5.3 to 9.9 percent. There is little question that some of the commercial mixtures contain even larger percentages of this copper salt. Such poisoning results in "an

extremely rapid, irregular pulse, accompanied by shallow, hurried respirations in practically all cases, but the temperature seldom, if ever, rises above normal. The disease ordinarily terminates fatally within 24 to 48 hr. after the first appearance of the characteristic symptoms, but occasionally affected animals linger for considerably longer periods of time. Spontaneous recovery is comparatively rare but does occur. The notable lesions at autopsy are a yellowish, friable liver; enlarged, very dark brown to black kidneys; a swollen, 'blackberry jam' spleen; generalized icterus; poorly collapsed, doughy lungs; and a pale, flaccid heart."

"Typical cases of the condition as it occurred on the range were produced experimentally by the feeding of two such commercial mixtures to healthy sheep. There is no treatment for the condition, since the animal dies within a day or two after it manifests the characteristic symptoms. Because copper is eliminated very slowly from the body many animals die from the poisoning for weeks or a few months after the source of the copper has been removed. Experiments with a weak aqueous solution of copper sulfate as a drench show that danger of chronic copper poisoning resulting from the average routine use of this agent in controlling stomach worms is negligible if not impossible."

A list is given of 18 references to the literature.

Soil and mineral supplements in the treatment of bush-sickness, T. Rigg and H. O. Askew (*Empire Jour. Expt. Agr., 2 (1934), No. 5, pp. 1–8, pl. 1, fig. 1*).—The authors report upon a series of field trials initiated with a view to securing further information on the value of soil and other iron compounds in overcoming bush sickness. Sheep drenched with a small quantity of Nelson soil, containing 6 percent Fe_2O_3 soluble in N/10 oxalic acid, gained rapidly and continuously in weight until the onset of winter. They remained perfectly free from bush sickness and could have been sold as fat sheep in the autumn.

The causal organisms of entero-toxaemia, G. Edgar (*Aust. Vet. Jour., 10 (1934), No. 6, pp. 209–212*).—The author concludes that *Clostridium ovitoxicus*, one of the four types of *C. welchii* (type A or *C. welchii*, type B or lamb dysentery bacillus, type C or *C. paludis*, and type D or *C. ovitoxicus*) is the cause of enterotoxemia in New South Wales as has been found to be the case in Western Australia, New Zealand, Tasmania, and Wales.

Malignant oedema in sheep, C. S. Lo (*Lingnan Sci. Jour., 14 (1935), No. 1, pp. 155, 156, fig. 1*).—This is a report of sheep affected with malignant edema in Nanking, China, where for the past two or three years animals have become affected a month or two after shearing.

Immunization of sheep and goats against soremouth (contagious ecthyma), I. B. Boughton and W. T. Hardy (*Texas Sta. Bul. 504 (1935), pp. 16, figs. 3*).—The work here reported supplements in part that noted from another source (E. S. R., 71, p. 846).

The immunity conferred from vaccination with a sore mouth scab emulsion is said to endure for at least 28 mo., more than 2,500,000 lambs having been vaccinated with excellent results during the years 1933 and 1934. "Suckling lambs vaccinated on the range are immune to sore mouth infection in the feed lots some 6 to 8 mo. later. Only 2 (0.006 percent) out of a total of 21,872 vaccinated lambs developed the disease in the feed lots, while 1,616 (8.08 percent) lambs out of a total of 19,980 nonvaccinated manifested lesions of sore mouth while running with these vaccinated animals in the same feed lots.

"Vaccination of sore-mouth-infested animals is of definite value in shortening the course and reducing the severity of the disease as judged by the results obtained in one experiment with 25 sore mouth susceptible lambs. Field reports corroborate the results of this experiment.

"Apparently lambs inherit no immunity from immune mothers nor are there any immune bodies or substances secreted in the mother's milk, as judged by one experiment with 25 susceptible, newly born lambs."

The common worms of sheep and goats in India and their control, G. D. BHALERAO (*Agr. and Livestock in India, 4 (1934), No. 6, pp. 655–669, pls. 6*).—A practical, illustrated account of the helminth parasites of ovines in India, with the means for their control.

Life history of lungworms parasitic in swine, B. SCHWARTZ and J. E. ALICATA (*U. S. Dept. Agr., Tech. Bul. 456 (1934), pp. 42, figs. 24*).—A brief review of the earlier work, presented with a list of 16 references to the literature, is followed by a report of the authors' investigation.

It is shown that three species of lungworms, *Metastrongylus elongatus*, *M. salmi*, and *Choerostrongylus pudendotectus*, develop in various species of earthworms and molt twice before becoming infective to swine. Pigs become infected with lungworms by swallowing earthworms harboring these parasites in the infective stages. The infective larvae become localized in the wall of the esophagus and in the blood system, particularly the hearts, of earthworms. *Helodrilus foetidus*, *H. caliginosus trapezoides*, and *Diplocardia* sp. were used as experimental intermediate hosts in tracing the life cycle of swine lungworms.

Earthworms collected in hog lots, pastures, and other places frequented by hogs were found to harbor infestations with lungworm larvae; larvae in natural infestations of earthworms were equally as abundant or more so than those found in experimental infections. In pigs and in young guinea pigs the further development of lungworms is accompanied by two molts; both molts may take place in the mesenteric lymph glands when the larvae become arrested in these glands. The two final molts were observed as early as 3 days after experimental infection of the definitive host. *M. elongatus* develops to egg-laying maturity in 24 days. Experimental infection of definitive hosts produces petechial hemorrhages in the lungs during the early stages of the development of the lungworms. Later changes in the lungs are consolidations of lung areas in which the worms are localized.

The various developmental changes of the three species of lungworms are described and illustrated.

Experimental studies on encephalitis.—III, Survival of encephalitis virus (St. Louis type) in Anopheles quadrimaculatus, L. T. WEBSTER, A. D. CLOW, and J. H. BAUER (*Jour. Expt. Med., 61 (1935), No. 4, pp. 479–487, fig. 1*).—It was found that *A. quadrimaculatus* mosquitoes, fed on mice in which encephalitis virus (St. Louis type) is present in the blood stream, take up and retain the virus for the duration of their lives. The virus-containing mosquitoes did not infect mice or monkeys by biting.

Multiplication of equine encephalomyelitis virus in mosquitoes, M. H. MERRILL and C. TEN BROECK (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 421–423*).—In continuation of earlier work (E. S. R., 72, p. 695), the authors report studies in the course of which the virus of equine encephalomyelitis was passed in series through 10 lots of the yellow-fever mosquito, and they were led to conclude that its multiplication took place. No difference was found between mosquito passage virus and the original strain. Its serological characters are said to have remained unchanged, the virulence having been modified little if at all. It passed Berkefeld N filters readily. Mosquitoes infected with the passage strain readily infected guinea pigs by biting. The virus seemed to be generally distributed in the bodies of the mosquitoes, having been demonstrated by guinea pig inoculation in suspensions of legs removed from uncrushed insects as well as in suspensions of the body fluid, head, thoraces, and abdomen. The mortality in

the cages containing infected mosquitoes was no higher than in those containing normal ones.

Equine encephalomyelitis, A. L. BRUECKNER, L. J. POELMA, C. L. EVERSON, and R. C. REED (*Maryland Sta. Bul. 369 (1934), pp. 137–146*).—This account of equine encephalomyelitis is based upon a study made during the outbreak in Maryland in 1933, when the disease appeared on the Eastern Shore and in southern Maryland.

Mules were observed to be less susceptible than horses. The morbidity rate among horses on affected farms was 12 percent and the mortality rate 83 percent. "Antiencephalomyelitis serum prepared against western type virus showed no antiviral value in vitro. The same serum used under field conditions showed no prophylactic value, since the morbidity rate was 10 percent and the mortality rate was 85 percent; the mortality rate when the serum was used as a curative was 70 percent. The mortality rate on sick horses not given serum was 65 percent. The most plausible explanation for transmission in Maryland during this outbreak seemed to be through mosquitoes and possibly other insect vectors."

Reports received from the tidewater sections of Maryland indicate that there are losses of some horses and mules nearly every year, and that during some years the losses have been extremely heavy. There appears to have been an extensive outbreak in 1900 and another of less serious proportions in 1919. The greatest losses seem to have occurred during summers when the rainfall was extremely heavy and low pastures were flooded.

Equine encephalomyelitis, D. E. MADSEN (*Utah Acad. Sci., Arts and Letters, Proc., 11 (1933–34), pp. 95–99*).—This contribution from the Utah Experiment Station refers to the occurrence, symptoms, epizootiology, and treatment of the disease in that State.

Environment and poultry diseases, L. VAN ES and J. F. OLNEY (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 3, pp. 390–406*).—This contribution, based upon observations made at the Nebraska Experiment Station, deals with the subject as related to pullorum disease, blackhead, tuberculosis, fowl cholera, coccidiosis, and fowl typhus.

[Report of work in avian pathology and parasitology at the Hawaii Station] (*Hawaii Sta. Rpt. 1934, pp. 26, 27*).—Brief reference is made to the progress of work with sorehead or fowl pox and gizzard worm control, respectively, conducted during 1934 (E. S. R., 72, p. 391).

[Report of work in avian pathology by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 139, 140*).—Fowl pox control among baby chicks is briefly referred to by O. E. Goff and R. B. Thompson, and the reaction of pigeons to the pullorum test by Goff.

Studies on an uncomplicated coryza of the domestic fowl, III, IV, J. B. NELSON (*Jour. Expt. Med., 61 (1935), No. 3, pp. 351–359; 361–367*).—This is a continuation of the studies previously noted (E. S. R., 70, p. 684).

III. *The effect of extranasal injection on the growth of the fowl coryza bacillus.*—It was found that "the mucous surfaces of the nasal passages and orbital sinuses appear to afford particularly favorable conditions for the development of the fowl coryza bacillus. Injected in the nasal tract, in any appreciable number, the bacilli regularly develop and may continue to exist for a considerable period of time in spite of an active inflammatory reaction on the part of the host. The specific bacillus multiplies either sparsely or not at all when injected extranasally, regardless of the nature of the cellular surface with which it is brought in contact. If the locus of injection is in communication with the upper air passages, as in the case of the trachea, internal ear, and orbital cavity, the bacilli may be carried there, even in the absence of a local development, and produce a coryza. Introduction of the bacilli in loci not in communication with

the upper air passages is followed by a nasal carriage only in the case of the peritoneal cavity. Following intraperitoneal injection, 7 of 12 birds showed the specific bacillus in the nasal passages and except in one instance without an accompanying inflammation."

IV. *Susceptibility after extranasal injection of the fowl coryza bacillus.*—"Intratracheal, intracloacal, and subcutaneous injection of living cultures of the fowl coryza bacillus had no demonstrable effect on the susceptibility of fowl to coryza. Intraperitoneal injection was irregularly followed by a definitely altered susceptibility. Growth of the specific bacillus was inhibited in the nasal tract of approximately 70 percent of 25 birds which had received an earlier intraperitoneal injecton."

Uncomplicated fowl-coryza, J. B. Nelson (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 3, pp. 409–418*).—This contribution is based upon the investigations noted above.

Studies on fowl paralysis.—I, Diagnosis, E. Jungherr ([*Connecticut*] *Storrs Sta. Bul. 200 (1934), pp. 28, figs. 7*).—In this contribution the author presents a critical evaluation of various clinical tests that have been suggested for the diagnosis of fowl paralysis in the living bird, based upon an investigation commenced in 1930.

"Since spontaneous cases of fowl paralysis showed a relative and an absolute lymphocytosis, a positive mercury bichloride test, and a characteristic Guttadiaphot picture in a fairly high percentage of the cases, an attempt was made to follow the pathogenesis of the condition by three serial applications of the corresponding tests to experimentally injected chicks.

"Of 84 inoculated and 24 control chicks which were pathologically examined at the age of from 3 to 4 mo., none showed any clinical or macroscopic evidence of the disease; the serial tests did not furnish any true indication of infection, but on microscopic examination of the brain, the inoculated and the control group exhibited marked lesions in 38 percent and suspicious lesions in 23 percent of the birds. The difficulties connected with the diagnostic interpretation of such lesions are pointed out.

"In the light of our present knowledge, it would appear that the diagnosis of cases of fowl paralysis should be based upon the macroscopic and characteristic microscopic changes in the peripheral nerves of the naturally affected chicks, and of those employed in transmission experiments."

A list is given of 62 references to the literature.

The etiologic and diagnostic aspects of the fowl paralysis problem, E. Jungherr (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 3, pp. 424–432, figs. 3*).—This is a contribution from the [Connecticut] Storrs Experiment Station on the present status of the fowl paralysis problem, presented with a list of 18 references to the literature.

The etiology of fowl paralysis (neuro-lymphomatosis gallinarum—Pappenheimer), leucosis, and allied conditions in the fowl, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 3, pp. 419–423*).—This contribution relates to investigations at the Florida Experiment Station, a report of which has been noted from another source (E. S. R., 72, p. 843).

Whole blood testing for pullorum disease, R. E. Lubbehusen, J. R. Beach, and E. R. Temperli (*Nulaid News, 12 (1935), No. 11, pp. 26–29, figs. 5*).—The authors conclude that the efficiency of the whole blood (stained antigen) test will not permit of its exclusive use in a program of pullorum disease eradication. By retesting with the whole blood method at short intervals the number of pullorum-infected birds may be reduced to a low percentage, and the flock in this way be prepared for accreditation or certification as pullorum disease free on the basis of the more highly efficient tube test. Official recognition of

flocks as pullorum disease free should be reserved to the tube test results until the whole blood test has been improved to the point that its efficiency equals that of the tube test.

A note on experimental salt poisoning in ducks, J. P. TORREY and R. GRAHAM (*Cornell Vet., 25 (1935), No. 1, pp. 50–53*).—Experiments at the Illinois Experiment Station are reported in which Peking ducks fed shelled corn that had been previously immersed in saturated sodium chloride brine remained healthy. "It would seem that the amount of sodium chloride necessary to produce ill effects in Peking ducks is not absorbed in that amount of shelled corn consumed by ducks following fasting. The lethal dose of sodium chloride for half-grown Peking ducks apparently lies in a range of four consecutive daily doses of 4 to 6 g. Peking ducks withstood 1 to 2 g of sodium chloride daily for a period of 29 days.

"The results of these studies suggest that ducks are more susceptible to sodium chloride poisoning than are chickens, as judged by reports of sodium chloride tolerance of chickens by different investigators. If susceptibility and tolerance of Peking ducks to sodium chloride are comparable to susceptibility and tolerance in wild ducks, it is apparent that poisoning wild ducks by feeding shelled corn which has been immersed in sodium chloride brine could not easily be accomplished. Furthermore, experimental fatal cases of sodium chloride poisoning in Peking ducks did not resemble the spontaneous syndrome in wild ducks, while the gross pathological changes encountered at autopsy did not resemble the gross pathological changes encountered in wild ducks that died on the Illinois River (1933) [E. S. R., 72, p. 538]."

Capillaria infestations in New Jersey pheasants, G. L. GRAHAM (*Jour. Parasitol., 21 (1935), No. 1, pp. 61, 62*).—Nematodes associated with lesions in the upper digestive tract of seven young adult ring-necked pheasants from the State Game Farm at Forked River, N. J., in November 1925 suffering from a diphtheritic disease were identified as *C. annulata* (Molin 1858), of which *Trichosomum strumosum* Reibisch 1893 and *Trichosoma delicatissimum* Perroncito and Tomiolo 1899 are synonyms. Although *C. annulata* has not previously been reported from pheasants in the United States, it is known to be a parasite of pheasants and chickens in Europe and elsewhere. It has been reported from chickens, turkeys, quail, grouse, and partridge in the United States and appears to have a wide geographical distribution. The author considers it probable that ingestion of infective eggs will produce infestations in many gallinaceous birds. In addition to *C. annulata*, the capillarid species *C. contorta* Crep., *C. longicolle* Rud., and *C. meleagris gallopavo* have been reported as pheasant parasites, the latter two being from the small intestine.

Salmonella aertrycke variant as an etiologic agent of paratyphoid in pigeons, E. JUNGHERR and K. S. WILCOX (*Jour. Infect. Diseases, 55 (1934), No. 3, pp. 390–401*).—Contributing from the [Connecticut] Storrs Experiment Station, the authors report upon an investigation of losses of from 15 to 20 percent of the annual squab production occurring on a pigeon farm of about 1,400 breeders.

"Although trichomoniasis and strongylosis seemed to be contributing factors, the isolation of a paratyphoidlike organism and the widespread sensitization to this organism in the breeding stock signified its etiologic importance. In preliminary tests the causative organism produced acid and gas in broth containing dextrose and slight acid in dulcitol; it did not attack maltose, lactose, and sucrose and was agglutinated by standard *S. pullorum* antiserum in dilutions of 1 : 1,200. On further study by biochemical means and limited serologic receptor analysis the organism was identified as an atypical maltose-fermenting variant of *S. aertrycke*. Attention is called to the misleading

influence of dissociation phenomena on cross agglutination between *S. pullorum* and motile paratyphoid organisms and, in general, on the diagnosis of pullorum disease in unusual hosts."

Experimental modification of the diurnal oocyst-production of the sparrow coccidium, D. C. Boughton, F. O. Atchley, and L. C. Eskridge (*Jour. Expt. Zool., 70 (1935), No. 1, pp. 55–74, figs. 3*).—The studies reported have led to the conclusion that "the intervals between the peaks of oocysts can be shortened and lengthened by subjecting the hosts schedules involving an alternation of a light and dark period within units of 19 and 29 hr., respectively, with the result that the number of peaks corresponds to the number of artificial days. The shifts in the peaks of oocysts cannot be explained as due to the ingestion of infective material nor to the increased fecal discharge during the feeding periods of experimental schedules. Under experimental conditions oocysts may be discharged during periods of host activity in which they would not appear normally. The mechanism controlling the periodic production of oocysts operates in a light-dark period which precedes the appearance of the oocysts by approximately 48 hr. The diurnal periodicity in the oocyst production in the *Isospora* of the sparrow is controlled in some manner by daily host activity, and in several respects its behavior is similar to that of the periodic asexual sporulation of the *Plasmodium* in the canary."

AGRICULTURAL ENGINEERING

The opportunities of the agricultural engineer for aiding recovery, R. W. Trullinger (*Agr. Engin., 15 (1934), No. 11, pp. 379, 380, 393, fig. 1*).—This is a contribution from the U. S. D. A. Office of Experiment Stations in which it is pointed out that the more important opportunities for the agricultural engineer to aid in recovery lie in efforts to find his place in the national movements to rehabilitate agriculture.

[Agricultural engineering investigations by the Alabama Station] (*Alabama Sta. Rpt. 1933, pp. 7, 9*).—The progress results are presented of investigations by E. G. Diseker on field curing and baling cowpea hay, by A. Carnes on soil crust formation, and by M. L. Nichols on soil dynamics.

[Agricultural engineering investigations by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 49–51, 127*).—The progress results are briefly presented of studies by F. J. Zink on the influence of the method of harvesting and baling alfalfa hay upon quality and on the efficiency of the combine for harvesting grain sorghum, and by C. O. Swanson and F. C. Fenton on shrinkage and damage of wheat in farm storage, and on soil erosion and moisture conservation in cooperation with the U. S. Department of Agriculture.

[Agricultural engineering investigations by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 9–22, 28–33, 284–293, figs. 10*).—The results are presented of investigations on soil conservation and moisture control, by N. E. Winters; the action of a heavy rain on a terrace drainage system, by H. M. Wallace; means of clarifying pond water, moisture movement on terraced soils, and control of soil erosion by vegetation, all by H. J. Harper; and the safety factor in terrace design, by L. E. Hazen.

[Agricultural engineering investigations by the Oregon Station] (*Oregon Sta. Bul. 334 (1934), pp. 35, 36, figs. 2*).—The progress results are briefly presented of investigations on drying shelled corn by forced draft with heated air, hop drying, electric soil sterilization, and warming poultry house floors.

The functions of the Virginia Engineering Experiment Station, E. B. Norris (*Va. Engin. Expt. Sta. Bul. 19 (1934), pp. 32, figs. 15*).—This is a brief prospectus which discusses the general features of industrial research and

points out specifically the functions of the engineering experiment station at the Virginia Polytechnic Institute. Lists of active research projects and of technical and extension bulletins are included.

[Agricultural engineering investigations by the Washington Station] (*Washington Sta. Bul. 305 (1934), pp. 58–61, 64–68*).—The progress results are briefly presented of investigations conducted at the Irrigation Branch Experiment Station on orchard irrigation and soil moisture relationships, irrigation of field crops, and specific conductance of irrigation water and soils, all by C. A. Larson; and at the Pacific Northwest Soil Erosion and Moisture Conservation Experiment Station on vegetative control of erosion, soil moisture, and soil building rotations, by C. E. Deardorff; terracing and operation of machinery on terraced lands, by P. C. McGrew; tillage, wind erosion, a protective vegetative strip on summer fallow, and utilization of clay points by planting to timber cover, by Deardorff and McGrew; and species, varieties, and strains of perennial grasses and legumes for erosion control, by A. L. Hafenrichter and Deardorff.

Agricultural engineering investigations in the past twenty-five years, A. L. Teodoro (*Philippine Agr., 23 (1934), No. 5, pp. 363–367, figs. 2*).—This is a brief review of the outstanding results of agricultural engineering investigations at the University of the Philippines during the past quarter century. The outstanding investigation was that relating to the development of alcohol as an internal-combustion-engine fuel.

[Irrigation investigations by the Nevada Station], G. Hardman (*Nevada Sta. Rpt. 1934, pp. 34–36, fig. 1*).—The progress results are briefly presented of studies in the reclamation of certain desert soils under irrigation from artesian wells in the Las Vegas Valley of southern Nevada.

A nomographic solution of the rational run-off formula, G. B. Drummond (*Agr. Engin., 16 (1935), No. 1, p. 13, fig. 1*).—In a contribution from the Oklahoma Experiment Station a chart is presented for the solution of this formula.

Soil erosion control and soil moisture regulation in relation to State and National land-use planning, H. B. Roe, edited by W. Boss (*Agr. Engin., 15 (1934), No. 12, pp. 428–430*).—This contribution from the Minnesota Experiment Station was prepared specially for consideration by the National Resources Board in connection with its deliberations relative to State and National land-use planning. It is based on investigations by the station, mostly in cooperation with bureaus of the U. S. Department of Agriculture.

Results of engineering experiments at the soil erosion stations, C. E. Ramser (*Agr. Engin., 15 (1934), No. 11, pp. 381–386, figs. 7*).—This is a contribution from the U. S. D. A. Bureau of Agricultural Engineering in which a summary is given of some of the more important experiments being conducted at the soil erosion experiment stations. These relate primarily to the proper spacing, grade, height, cross section, and limiting lengths of terraces for any particular soil or land slope. Information also is given relating to methods of constructing and maintaining terraces and on the proper size, location, and control of terrace outlet ditches.

The data relating to the relative losses of soil by erosion from terraced and unterraced lands demonstrate the great value of terraces as conservers of the soil. Terraces also are effective in conserving the rainfall. At two of the stations the data show that level terraces with open ends are more effective in conserving both the soil and water losses than terraces having a uniform grade of 4 in. per 100 ft. The results of a 2-yr. experiment at one station continued to show that soil losses increase with the length of the terrace. The results in general are taken to indicate that the variable grade terrace is more efficient in conserving both soil and water and does not require as great

a height as the uniform grade terrace. Apparently also soil losses increase with an increase in terrace spacing. The results relating to this feature are taken to indicate that terraces should be spaced close enough together to prevent the concentration of water and appreciable erosion on the land slope between the terraces. It is also concluded that the control of erosion in a terrace channel can be accomplished to a limited extent by the shape of the channel.

Dynamics of earth and other macroscopic matter, J. H. Griffith (*Iowa Engin. Expt. Sta. Bul. 117 (1934), pp. 152, figs. 39*).—This is a highly technical contribution in which dynamical unity and logical consistency with the established principles of mathematical physics are kept uppermost in connection with the development of theories for the behavior of earths and engineering substructures. The main subjects dealt with are the structural organization of matter; dynamical equations; lateral pressure of earths; analysis of retaining walls; tunnels, conduits, and other inclusions; the theory of piles and foundations; the theory of embankments; the hardness of matter; the theory of plasticity; and the degradation of energy and equilibria of heterogeneous matters.

Methods of fixation and porosity determination in the study of soil mechanics, N. F. Miscenko (*Agr. Engin., 16 (1935), No. 1, pp. 23–29, figs. 11*).—This contribution from the Lenin Academy of Agricultural Science of the Union of Soviet Socialist Republics presents the fundamental concept of the engineering problems involved in soil tillage and describes methods used in Russia in such studies. It is mainly of interest to the research worker in soil dynamics in that it deals primarily with research methods and equipment.

Erosion control handbook: Project No. 14, Zanesville, Ohio (*U. S. Dept. Interior, Soil Erosion Serv., [1934], pp. [3]+69, figs. 21*).—This mimeographed handbook has been prepared by the staff of the Soil Erosion Service of the Salt Creek Area. It shows the general plan and organization of the Salt Creek Watershed and presents information on gully control methods. These methods involve the use of engineering structures, trees and shrubs, and grasses and legumes. Numerous working drawings of gully control structures are included, together with engineering data.

Requirements of a terracing machine, R. W. Baird (*Agr. Engin., 16 (1935), No. 1, pp. 3, 4, 5*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering the requirements of a terracing machine are enumerated.

A new type of terracing machine, E. V. Collins, W. C. Ayers, and L. W. Johnson (*Agr. Engin., 16 (1935), No. 1, pp. 6, 7, figs. 7*).—In a contribution from the Iowa Experiment Station a new type of terracing machine is briefly described which involves the principle of a high-speed pulverator. The machine consists essentially of a single-bottom tractor plow with shortened moldboard and a rotor driven by the power take-off into a transmission providing either a direct drive or an overdrive of 1.8 to 1.

Experimental results with rammed earth construction, J. R. McCalmont (*Agr. Engin., 15 (1934), No. 11, p. 387, figs. 2*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering a description is given of two buildings constructed of rammed earth for use in connection with experimental work. Data are given on strength tests of soil samples, plain and mixed with different proportions of cement. These indicate that the compressive strength increased as the amount of cement in the mixture increased.

Public Roads, [January and February 1935] (*U. S. Dept. Agr., Public Roads, 15 (1935), Nos. 11, pp. 253–272+[2], figs. 8; 12, pp. 273–288+[2], figs.*

15).—These numbers of this periodical contain the status of U. S. Public Works road construction as of December 31, 1934, and January 31, 1935, respectively. No. 11 also contains an article on Experiments with Road-Mixes and Surface Treatments in California, by T. E. Stanton and J. T. Pauls, and No. 12 an article on Soil Road Surfaces, by C. A. Hogentogler.

Dry-rot investigations.—XI, Testing and determining the preservative value of fire preventive treatments for wood, R. Falck and V. Kerkar (*Hausschwammforschungen.—XI, Prüfung und Schutzwertbestimmung der Feuerschutzmittel des Holzes. Jena: Gustav Fischer, 1934, pp. IV+46, figs. 5; Eng. abs., pp. 39–46*).—An effort is made in this study to express the fire resistance of wood in one term, the purpose being to evaluate fireproofing treatments, particularly paints.

Data are presented on the determination of the ignition point and fire resistance of wood, on factors of combustibility and the effect of concentration of chemicals thereon, the preservative value of chemicals and fireproof paints, and resistance to washing out of some of the important fireproofing materials.

Fireproofing treatments for dry wood include a solution of arsenic and sodium carbonate, which has a fireproofing value of 60 percent. A less effective treatment consists of a mixture of arsenic, boric acid, and sodium carbonate. A mixture of arsenic and boric acid is recommended for the fireproofing of wood partly exposed. A solution of zinc sulfate and arsenic also can be used for this purpose, but apparently is not so satisfactory.

For wood used in inhabited rooms, it is recommended that a solution of aluminum sulfate and boric acid be used, although a solution of boric acid alone has been found to have a fireproofing value of 50 percent.

The use of portland cement and fluorides is recommended for the fireproofing of wood subjected to weather.

Distillate burners, A. H. Senner (*U. S. Dept. Agr. Circ. 335 (1934), pp. 12, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering, practical information is presented on the distillate burner type of heating equipment which has been derived from the results of tests of burners of various designs. The operation of one type of distillate burner is described.

It appears to have been found that kerosene is preferable to No. 1 fuel oil as a fuel for distillate burners. Practical suggestions are made on the selection and care of equipment.

Modern bearing design, L. M. Tichvinsky (*Machinery, 41 (1935), No. 5, pp. 265–270, figs. 4*).—A technical analysis is presented indicating how the allowable loads for plain or sleeve bearings are determined.

Mechanics of plow and tractor hitches, A. W. Clyde (*Agr. Engin., 15 (1934), No. 11, pp. 388–390, figs. 8*).—Studies conducted at the Pennsylvania Experiment Station are reported which considered mainly the horizontal components of the forces involved in plow and tractor hitches.

The data show that the pull exerted by a power unit on a load is not necessarily in the direction of travel. Every power unit has a rather definite center of force and every plow has a center of resistance. If these points are not in the same line of travel, the pulling force must be angled or must be offset on the power unit. The center of resistance for any plow and field conditions can be located approximately in a horizontal plane by pulling the plow through a chain.

The conclusion is drawn that side draft is a vague term meaning little, unless the type of side draft is specified. This applies both to the power unit and to the implement.

The results show that the simple force triangle will show how changing the angle of pull affects the amount of pull needed, if suitable values of the angle 4

and coefficient of friction μ are used. As far as the plow only is concerned, the ideal direction of pull would be near the line of resistance on the share and moldboard in order to keep land-side friction as low as possible. Usually the hitch must compromise on this point because of the power unit. The center of resistance of a plow can be moved nearer the land side by moving the resultant land-side pressure back. This will reduce the angle of pull with a wide power unit.

A vegetable seeder and cultivator for the one-plow tractor, D. C. Sprague (*Agr. Engin., 16 (1935), No. 1, pp. 20–22, figs. 5*).—In a brief contribution from the Pennsylvania Experiment Station this equipment is described. The results of studies indicate the possible utility of this equipment for the growing of vegetable crops. The machine is designed either to seed or to cultivate six 18- or 20-in. spaced rows at once.

A study of suitable equipment for applying sulphuric acid for weed control, O. C. French and W. E. Ball (*Agr. Engin., 15 (1934), No. 12, pp. 411–413, figs. 7*).—The results of a study conducted by the California Experiment Station in cooperation with the Crop Protection Institute and California State Department of Agriculture are presented. They show that it is feasible to use an ejector in connection with an ordinary spray pump to handle acid solutions, thus eliminating the corrosive effects of acid on the working parts of the pump.

It was found that all pipes, pipe fittings, and nozzles coming in contact with dilute sulfuric acid must be brass. Pure nickel or monel metal spray-nozzle disks are practically acid proof and are superior to brass.

Electric hotbeds for propagating woody cuttings, D. Wyman and M. W. Nixon (*[New York] Cornell Sta. Bul. 618 (1934), pp. 21, figs. 18*).—This bulletin describes and illustrates the planning and installation of electric hotbed equipment for propagating woody cuttings, and reports the results of 3 yr. of investigations with deciduous and evergreen cuttings in which electrically heated and manure-heated beds were compared as to cost of operation.

The results show that electric hotbeds for use in the summer for rooting cuttings are practical. Where a large series of electric hotbeds is installed, these beds are much cheaper than a similar series of manure hotbeds when costs are considered over a period of years. The temperature can be regulated very closely in the electric hotbed when outside temperatures are lower than that required in the hotbed. Electric heat can be very effectively used in greenhouse benches to supply bottom heat for rooting cuttings. Complete and automatic control of greenhouse temperature and humidity is not economical at the present time, although it offers an excellent opportunity to maintain controlled conditions for experimental work in rooting cuttings. In general, it is not claimed that rooting is better in electric hotbeds than in manure hotbeds for all kinds of cuttings, particularly when several types of cuttings are being rooted in the same bed at the same time. In such cases the rooting may often be about the same in the two kinds of hotbeds.

Cooling milk on the farm with small mechanical outfits, R. P. Hotis and J. R. McCalmont (*U. S. Dept. Agr. Circ. 336 (1934), pp. 24, figs. 8*).—This circular presents and discusses the results of a study made on 44 dairy farms in Maryland and Virginia where mechanical equipment for milk cooling, using electricity as power, had been installed. The amount of milk handled ranged from 15 to 200 gal. per day per farm. Data were obtained on methods of arrangement and operation, power consumption, cost of equipment and repairs, and efficiency of the different outfits in comparison with each other and with equipment in which ice was used.

The results indicate that a refrigerating machine for cooling and storing milk on the dairy farm should be of such size that the compressor will not have to run over 14 hr. per day, if efficiency of operation is to be assured.

The average cost of complete outfits on 23 farms was about $7.69 per gallon of milk storage, and the average cost per 10-gal. can of rated storage capacity ranged from $48 to $106, the lower cost being for the larger storage capacity. The cost of repairs on 19 farms averaged $4.20 per year. The amount of water in the storage tank will vary according to the amount of milk cooled. The amount of coil to use per cubic foot of tank will vary according to the amount of milk to be cooled and stored per 24 hr., the range of temperature through which the milk will be cooled, the temperature of the well water used through the surface cooler, and the thickness of the tank insulation. Bunched coils are difficult to support rigidly, and ice forms on them easily. Machines running on an average of 9.1 hr. per day used less power per gallon of milk cooled and per gallon-degree of refrigeration than machines running on an average of 17.5 hr. per day. A well-constructed, well-insulated storage box cooling to capacity should have a refrigeration loss of less than 30 percent. Home-built tanks observed were as efficient as commercially manufactured tanks, but carried more insulation.

The power consumption is higher with dry-box storage than with wet-tank storage, but lower temperatures are possible with a dry box. Well water used through the upper half of the cooler will lessen the load on the mechanical outfit and allow it to care for more milk.

Cost of power was less than cost of ice. However, no data were available on depreciation, so this factor and interest and repairs are not taken into consideration in this comparison.

Plans are also included for an inexpensive home-made storage tank or refrigerator box, depending on which is to be used with the machine.

Moisture changes in some agricultural products due to atmospheric conditions, W. R. Humphries and W. M. Hurst (*Agr. Engin., 16 (1935), No. 1, pp. 8–11, 12, figs. 4*).—The results of tests conducted by the U. S. D. A. Bureau of Agricultural Engineering are briefly reported in which observations are made on the effect of exposure on the rate of change in moisture content of samples of grain. The grains tested were corn, flaxseed, oats, rice, soybeans, grain sorghum, and wheat. Tests also were made of seed cotton and hay.

The results indicate that storage bin ventilation would be effective provided the grain is exposed to air in thin layers. Even in 4-in. layers wet grain would probably go out of condition before drying unless provision is made for forced ventilation or moving the grain at frequent intervals. The data in general indicate that the relative humidity of the atmosphere to which samples of cereal grains, flaxseed, soybeans, seed cotton, and hay were exposed influenced the moisture content of the samples to a much greater extent than did the air temperature.

The engineering side of producing woven wire fencing, J. L. Schueler (*Agr. Engin., 15 (1934), No. 11, pp. 391–393, figs. 4*).—This is a brief discussion of the features of engineering design of woven wire fencing.

Houses and equipment for poultry in Florida, N. R. Mehrhof and F. Rogers (*Fla. Univ. Agr. Ext. Bul. 77 (1934), pp. 38, figs. 28*).—Practical information is presented on the construction of poultry houses and on different types of equipment to be used in the management of birds of various ages.

Paints and finishes for farm structures, J. W. Iliff (*Agr. Engin., 15 (1934), No. 12, pp. 424–427, figs. 5*).—A summary of technical information on the subject is presented.

Experiments with ventilating cowls, C. Nøkkentved (*Agr. Engin., 16 (1935), No. 1, pp. 14–19, figs. 8*).—The results of experiments conducted at the Royal Technical College of Copenhagen are presented. The tests were all conducted in a wind channel. In the first series the cowls were placed with the axis at right angles to the air stream. In the second series the axes of the cowls sloped away from the wind at an angle of 25°, simulating a condition where a cowl is placed on a roof with a slope of 25°. A third series of experiments was carried out with the cowls inclined toward the wind, forming an angle of 25° with it and thus illustrating a downward whirlwind which might cause down draft.

The data are presented graphically, and indicate that a cowl sloping away from the wind gives increased effect, whereas a cowl sloping toward the wind gives a decreased effect. Some information is given on the relative values of different types of cowls.

Job analysis of a rural sanitation officer: Brunswick-Greensville Health Administration Studies No. 2, J. O. Dean and J. W. Mountin (*Pub. Health Rpts. [U. S.], 49 (1934), No. 51, pp. 1529–1543, fig. 1*).—In a contribution from the U. S. Public Health Service the duties of a rural sanitation officer are briefly described, with particular reference to water supply and excreta disposal. The analysis is based on the work of one officer in a rural health district containing 6,733 homes over a period of 6 mo. The sanitation program, which had been in operation for 10 yr., concerned itself almost exclusively with facilities for excreta disposal. Maintenance of privies was the major activity. Among 1,468 premises visited for privy sanitation, 116 were found to have no excreta disposal facilities at all, 1,095 had privies of the insanitary class, 90 of the sanitary, and 167 of the approved class.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1933–34, pp. 18–26*).—Brief statements are made as to the findings in studies of the improvement in farm incomes from 1931 to 1933, land taxation and finance, the marketing of Kansas wheat, livestock and livestock products, fruits and vegetables, and dairy products, and the economics of the poultry industry in Kansas, and of a study in cooperation with the Brookings Institution of the operation by the Agricultural Adjustment Administration of the wheat, corn-hog, and dairy programs in Kansas.

[Investigations in agricultural economics by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 191–204, 214–217, figs. 2*).—Included, in addition to findings previously noted, are data by P. Nelson for 1932 and 1933 supplementing the bulletin previously noted (E. S. R., 69, p. 292), and tables and a map by R. A. Ballinger showing by crop years 1924–25 to 1932–33 the number and book value of cotton gins, average number of bales ginned, gross and net revenue, and expenses per bale of ginning, and for 1929–30 to 1932–33 the investment, gross and net revenue, and expenses per bale for the gins grouped by number of bales ginned and by number of days operated.

The agricultural situation in 1932–33, A. Brizi (*Les Conditions de l'agriculture en 1932–33. Roma: Inst. Internatl. Agr., 1934, pp. VIII+606*).—This is a continuation of the series previously noted (E. S. R., 70, p. 113). The several chapters discuss the economic tendencies in agriculture, including economic planning and the evolution of the present commercial policies, the marketing situation of important crops, the international activities bearing on agriculture, and by countries the governmental measures enacted and activities of organizations in respect to and the economic situation of agriculture.

Measures of planned economy in agriculture in Czechoslovakia, H. BÖKER (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 25 (1934), No. 11, pp. 511–515*).—The measures establishing a cereal monopoly, regulating the production and sale of artificial fats, and regulating dairying production and pig raising are described briefly.

The agrarian reform in Yugoslavia, O. VON FRANGEŠ (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 25 (1934), Nos. 3, pp. 89–100; 4, pp. 125–136; 5, pp. 174–198, figs. 2; 6, pp. 209–230; 7, pp. 269–287; 8, pp. 311–327*).—The reasons for and the objects of the reform, the enactments, the regulations, and the operations under them, the agrarian systems before the reform, and the legal bases of the reform, its application, costs, results, etc., in the different parts of the State are described and discussed.

[Agricultural cooperation] (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 25 (1934), Nos. 2, pp. 62–76; 8, pp. 297–311; 11, pp. 492–511; 12, pp. 541–565*).—The following articles continue the series previously noted (E. S. R., 71, p. 122): Egypt, by J. Rashad (pp. 62–76), Bulgaria, by I. Mihailoff (pp. 297–311), and Rumania, by M. V. Pienesco (pp. 492–511, 541–565).

The quantitative regulation of imports of agricultural products in Great Britain and Northern Ireland, J. K. MONTGOMERY (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 25 (1934), No. 11, pp. 481–491*).—The regulations covering the principal agricultural products are described, and tables are included showing the importation since the regulation as compared with that during previous years.

Land settlement activities of the Employment Promotion Council, W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 11, pp. 1374–1392, figs. 10*).—The organization and activities of the council constituted on September 5, 1932, are described and discussed.

Relationship between the type of soil and success of farm mortgage loans in southeast Alabama, E. H. MERENESS (*Alabama Sta. Rpt. 1933, pp. 6, 7, 8*).—A table, including 1,243 farm mortgage loans during the period 1917–31, shows the number of loans and the losses per $1,000 loaned, grouped by types of soil in 3 counties.

Reorganisation of agricultural credit in Spain, E. MARTINEZ DE BUJANDA (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 25 (1934), No. 12, pp. 566–571*).—The provisions of the decree of September 1932 reorganizing the National Service of Agricultural Credit are discussed.

A study of certain problems relating to the Nevada tax system, M. R. HOWARD (*Nevada Sta. Bul. 137 (1935), pp. 28, figs. 3*).—The receipts under the present tax system in Nevada and the increase in the property taxes since 1913 are described, and the amount of tax delinquency, value of delinquent property redeemed, etc., are discussed. The advantages, disadvantages, and possibilities of the use of income and sales taxes to replace property taxes in part are discussed and suggestions made.

Tax delinquency on rural and other property in Tennessee, C. E. ALLRED, P. B. BOYER, and R. E. HORNE (*Tennessee Sta. Circ. 53 (1935), pp. [8], figs. 9*).—This is a preliminary report of a study based on data from 163,000 rural properties for the years 1928–32, gathered in cooperation with the Bureau of Agricultural Economics, U. S. D. A., on C. W. A. funds, and the State tax delinquency reports of the Comptroller of the State Treasury, 1890–1932. Charts, a map, and a table are included, showing by counties the percentages of taxes on rural property that became delinquent in 1932, and by years the percentages of State property tax unpaid one or more years after becoming delinquent, 1890–1930 and 1932; and the comparative percentages in rural and urban counties, percentages

of rural property taxes becoming delinquent, 1929–32, in 16 representative rural and 6 urban counties, comparative county and State taxes on acreage property, 1916–33, the percentages the agricultural and nonagricultural income were of the total income of the State, 1919–30, and the percentages of net farm returns required to pay farm property taxes, 1922–33.

[Hail insurance], F. ARCOLEO ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *25 (1934), Nos. 2, pp. 77–83; 4, pp. 136–153; 6, pp. 243–247; 7, pp. 287–294; 8, pp. 333–341*).—These brief summaries cover the legislation and regulations concerning the type of organizations handling rates on different crops, the extent of such insurance, compensation payments made, etc., in Rumania (pp. 77–83), the United States (pp. 136–153), Queensland (Australia) (pp. 243–247), Argentina (pp. 287–294), and Czechoslovakia (pp. 333–341).

Managing the farm for better income, P. E. MCNALL and I. F. HALL (*Wisconsin Sta. Bul. 429 (1934), pp. 16, figs. 3*).—This is a popular bulletin discussing various factors affecting farm income in Wisconsin.

Efficient use of Missouri lands, G. T. BARTON ET AL. (*Missouri Sta., 1935, pp. 75, figs. 33*).—This is a series of maps of Missouri by counties with descriptions illustrating various phases of the land-use problem, such as soils, nitrogen content of soils, lime requirement, physiography, watersheds, erosion, topography, forests, land use, population, tenure of land, etc. Recommendations are made for the future use of different types of land. The local governmental aspects of land-use adjustment, such as governmental expenditures, tax rates, delinquency, and sales, and school costs and State aid to schools are discussed.

Effects of inflation and deflation upon Nebraska agriculture, 1914 to 1932, H. C. FILLEY (*Nebraska Sta. Res. Bul. 71 (1934), pp. 131, figs. 5*).—"This study attempts to give the effects of war-time inflation and the subsequent deflation upon Nebraska agriculture. It presents statistical evidence of what happened." The several chapters discuss inflation and deflation, changes in the prices of various commodities during inflation and deflation, prices and purchasing power of Nebraska farm products, 1914 to 1932, adjustments during inflation and deflation, the effect of wages on Nebraska agriculture, taxes, Nebraska farm income, changes in types of farming in Nebraska, 1914 to 1932, the banking situation, Nebraska farm land prices, and the effect of inflation and deflation upon Nebraska business. Some of the findings were as follows:

The indexes of purchasing power of Nebraska farm products (1910–14=100) ranged from 85 to 108 for the calendar years 1910–14, from 98 to 132 for 1915–20, 72 to 85 for 1921–24, 93 to 98 for 1925–29, and 54 to 83 for 1930–33. Taxes levied under the general property tax (State, county, schools, cities and villages, and township) were approximately 22½ million dollars in 1913, ranged from approximately 50⅓ to approximately 64 million dollars for the years 1919–27, from approximately 55 to 57¼ million dollars for the years 1928–31, and dropped to 48.3 million dollars in 1932. Labor income of farmers rose rapidly from 1914 to 1919, dropped precipitately in 1920, and remained low to 1924, rose materially from 1924 to 1929, and dropped very decidedly from 1930 to 1932. During the period of the study the production of livestock and livestock products increased, due primarily to the increase in freight rates; purchase of labor-saving machinery was hastened by high wages; livestock production and feed, dairying and poultry raising increased to provide more year-round labor for the farmers themselves; and there was a shift from wheat to feed crops in the eastern counties. Deposits in banks increased rapidly from 1914 to 1925, and loans and discounts to 1920, after which deposits decreased to less than the 1916 level, and loans and discounts to considerably less than the 1914 level in 1932. Farm real estate values per acre (1912–24=100) in-

creased from 98 in 1912 to 179 in 1920, then decreased rapidly to 90 in 1932, and to 69 in 1933.

Economic survey of the Walker River Irrigation District, F. B. Headley et al. (*Nevada Sta. Rpt. 1934, pp. 42–45*).—The conclusions reached in an economic survey are given.

Cost and efficiency in raising dairy heifers in Oregon, H. E. Selby and G. W. Kuhlman (*Oregon Sta. Bul. 324 (1934), pp. 38, figs. 6*).—This bulletin reports the results of a State-wide survey covering the 4 yr. ended April 1, 1933. A total of 574 farms cooperated, and 1,718 annual cost records covering 17,764 head of heifers and heifer calves were obtained. The average costs of raising heifers and the variations on different farms are discussed. Analysis is made by regions of the State of the effect on cost of death losses, culling, butterfat production of cow herd, feeding practices, purebred stock, age at freshening, breed, size of herd, and season of birth of calves. A short article by I. R. Jones on Suggestions on the Selection, Feeding, and Management of Dairy Heifers is included.

The average cost of raising a heifer to the average age of 25 mo. varied from $67 to $110 for the 4 yr. The average value at first freshening varied from $46 to $86. The average costs were distributed as follows: Feed and pasture 51 percent, losses on heifers dying or sold 21 percent, birth value 8 percent, labor 6 percent, use of buildings 4 percent, interest 4 percent, sire cost 3 percent, and miscellaneous cost 3 percent. A little over one-third of the costs required immediate cash expenditures. Thirteen percent of the heifers died before freshening, and 32 percent were sold before freshening at prices averaging less than the cost of raising. The cost of raising was nearly as high for heifers from low-producing cows as for those from high producers. Feed cost was $9 less on farms feeding skim milk than on those not using it, and $11 less where heifers were pastured more than 180 days than where they were pastured less than 90 days. The cost was higher for purebred than for grade heifers. The costs for Guernseys and Holsteins were higher than for Jerseys, but were offset by higher market values. The larger herds had lower costs. In the year ended April 1, 1932, the average cost was $69 on farms where the average age at freshening was less than 24 mo., $61 where it was 24 to 26 mo., and $69 where it was over 26 mo. The greatest possibility for reducing the cost of raising was in decreasing the death and culling losses.

Position of Australian wheat industry, C. A. S. Hawker (*Jour. Dept. Agr. So. Aust., 37 (1934), No. 9, pp. 1088–1111*).—This is a statement to the Royal Commission on the Wheat Industry (South Australia) covering the importance of the industry, its difficulties, subsidies in other countries, world wheat schemes, costs including indebtedness, interest, taxes, and freights, the effects of the tariff, previous grants, submarginal farms, yields, landholdings, side lines and alternative crops, prices, marketing, etc.

Farm accountancy statistics for 1930–31, A. Brizi (*Inst. Internatl. Agr. [Roma], Comptab. Agr. Rec. Statis. 1930–31, pp. XCV+642*).—This is the fourth volume of the series previously noted (E. S. R., 70, p. 869). Two additional regions, Deccan (India) and Kenya (Africa), are included. The tables and notes are given in both French and English.

Some considerations on the tables contained in farm accountancy statistics for 1927–28, 1928–29, 1929–30, and 1930–31, J. Deslarzes (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 25 (1934), No. 9, pp. 349–422, figs. 3*).—This is a study of the farm accountancy statistics previously noted for 1927–28 and 1928–29 (E. S. R., 69, p. 612), 1929–30 (E. S. R., 70, p. 869), and 1930–31 (see above). The author states that all that will be

attempted "will be to present figures and to make suggestions, leaving it to competent persons to draw conclusions or to unravel the laws."

Tables are included showing the representative character of the farms studied, comparing (1) the results from a financial standpoint, i. e., costs of production, the gross return, and the prices of agricultural products; (2) the structure of the farms in different countries; (3) the success of the farming enterprise from the economic standpoint—the net return, interest return on and the yield value of the landlord's capital, and the profit or loss of the operator; and (4) the success of the farming enterprise from the standpoint of the operator—social income, family farm earnings, and family labor earnings.

Mallee farm costing.—Farm No. 1, A. J. PERKINS (*Jour. Dept. Agr. So. Aust., 37 (1934), Nos. 6, pp. 635–648; 7, pp. 768–791; 8, pp. 928–958*).—The accounts kept by the Department of Agriculture for the three years 1929–30 to 1931–32 of this farm, managed and worked by the owner, are analyzed. The analysis illustrates the method used and shows the financial returns, the costs of growing wheat preceded by bare fallow and of oats in rotation with wheat, costs and returns of the farm flock of sheep, tractor farming costs, and the costs of the preparation of bare fallow.

Price movements and Pennsylvania agriculture, F. P. WEAVER and D. H. WALTER (*Pennsylvania Sta. Bul. 309 (1934), pp. 53, figs. 10*).—Tables are included showing the monthly prices paid to Pennsylvania producers for wheat, corn, oats, barley, rye, buckwheat, hay, potatoes, apples, chickens, hogs, cattle, sheep, lambs, milk, butter, eggs, wool, horses, veal calves, and dairy cows, and the index numbers (1910–14=100) of such prices. Other tables and charts show the index numbers for the dairy and sheep industries, poultry products, cereals, and the 20 commodities weighted for importance, commodities purchased by farmers, taxes on Pennsylvania farm real estate, Pennsylvania farm wages, freight rates, and purchasing power of Pennsylvania farm products in terms of commodities used in production. The significance of price changes—gold and bank credit as factors affecting the general price level—changes in prices of farm products in relation to prices of other commodities, and of one farm product in relation to other farm products are discussed.

Dairy industry prices [South Australia], W. J. DAWKINS ET AL. (*Jour. Dept. Agr. So. Aust., 37 (1933), Nos. 4, pp. 426–435; 5, pp. 512–526; 37 (1934), Nos. 6, pp. 676–686; 7, pp. 806–840*).—This is the report of the Royal Commission appointed "to inquire into and report upon the disparity between the prices paid by the consumer for dairy produce, the London parities of dairy produce, and the prices received by dairymen of South Australia for milk and cream, the cause of such disparities, and the remedies therefor." The several sections deal with (1) the metropolitan supply, supervision and control, costs of distribution of milk, readjustments in the milk industry, the claims of householders' milk for a higher unit price, types of milk offered, control of prices, quality in milk, and the Commission's recommendations for the administrative machinery and policies for the control of the milk supply; and (2) the national significance of butter, the determination of local butter and butterfat prices, and the recommendations of the Commission as to butter.

Economic considerations in marketing fluid milk, W. P. MORTENSON (*Wisconsin Sta. Res. Bul. 125 (1934), pp. 56, figs. 10*).—The interrelationship of dairy product prices, the influence of such prices on farm production of milk and surpluses in the market, the essentials of a sound price policy, types of milk price plans, the effect of new distributors upon prices, and the competition among distributors on butterfat content of milk sold are discussed. Analysis is made of distributors' margins on fluid milk, cream, and manufac-

tured products, distributors' costs and profits, the part of the consumers' dollar going to distributors and producers in different areas of the State and the United States, the effect of a reduction of distributors' margins on prices paid farmers, the trend of distributors' costs from 1927 to 1932, and the division of distributors' operating costs.

Different methods of public control of milk distribution and the competition of evaporated milk with fresh milk are discussed. Recommendations are made as to methods of discouraging "in-and-out" distributors and of reducing costs of collecting and distributing milk.

Cream marketing in southwestern Ohio, C. G. McBride and R. W. Sherman (*Ohio Sta. Bul. 546 (1935), pp. 28, figs. 2*).—The results of a study covering 5 counties, the greater part of 4 other counties, and parts of 6 other counties are given. The production of commercial butterfat and farm butter, 1919 and 1929, and the cream assembling systems are described. Analysis is made of the location and market outlets of cream stations, number of patrons, supplementary lines of business and tenure of operators, and of the operation of cream-truck routes, including types of roads, mileage, farm pick-ups of cream, weight of loads, ton-miles of cream hauling, types of commercial status, age, floor space, and present and probable mileage of trucks, other businesses of truckers, and gross receipts from and rates on routes.

The average number of patrons for the 201 cream stations in 1929 was 43, that of 50 percent of the stations being less than 28. The average decline in the number of patrons during the life of the stations was 37.5 percent. Over two-thirds of the stations engaged in some other business, country store and poultry and eggs being the most common. The average miles traveled per farm pick-up of cream truck was 2.7 for the full route and 1.8 miles over the part where cream was being picked up. Of the 127 cream routes 36 had 40 or more pick-ups and handled 56.2 percent of the total cream. One-third of the trucks made two-thirds of the pick-ups. The average weight of the trucks was 3,935 lb. and the average total load 1,900 lb., of which 1,300 lb. was cream. Only 40 percent of the trucks were over 2 yr. old. The trucks had been driven on an average of 35,650 miles and the estimated total mileage before trading in was about 71,150 miles. Gross receipts per week of the truckers varied from $2 to $100, averaging $27.11. Competition has resulted in many cases in very limited territory for individual stations and truck routes.

Cooperative vegetable marketing associations of the Lower Rio Grande Valley, W. E. Paulson (*Texas Sta. Circ. 74 (1935), pp. 22*).—The experiences of former cooperative marketing associations in the valley are briefly summarized and discussed for the information of growers interested in cooperative marketing.

Consumer preferences for potatoes, H. H. Bakken (*Wisconsin Sta. Res. Bul. 124 (1934), pp. 40, figs. 13*).—Using data gathered from 55 Chicago, Ill., and Milwaukee, Wis., hotels and 576 homes in these cities and Madison Wis., charts and tables show the number of times per day and the ways in which potatoes are served, the relation of income to consumption and ways in which potatoes are served, and the per capita consumption of people of different nationalities. The factors influencing consumers' choice, the elasticity of the demand, utilization of stocks not shipped to market, retail problems, practices, and prices, and motor truck transportation of potatoes and its effect on the markets for Wisconsin potatoes are discussed. Suggestions are made for a potato improvement program in Wisconsin.

Roadside markets in Maryland, S. H. DeVault and R. F. Burdette (*Maryland Sta. Bul. 365 (1934), pp. 41, figs. 20*).—Analysis is made of data gathered

in July to September, inclusive, 1933, from 147 farmer-owned (91 sold only produce grown on their own farms), 24 non-farmer, and 2 cooperative farm women's markets located on main highways. Forty-one were of a permanent type, 63 semi-permanent, and 69 temporary. The area, advantages of roadside marketing, and the types of markets are described. The influence on sales of location and facilities of markets, quality of products, prices charged, salesmanship, display, products sold, advertising, sanitation, appearance, and other factors are discussed. The protection of farmers' markets is discussed, and the constitution and bylaws of the Maryland Farm Roadside Market Association are included. Suggestions are made for the conduct of roadside markets.

Crops and Markets, [**January 1935**] (*U. S. Dept. Agr., Crops and Markets, 12 (1935), No. 1, pp. 32, figs. 3*).—Included are reports, summaries, charts, etc., covering crop and livestock estimates, market reports of livestock, livestock products, dairy and poultry products, fruits and vegetables, cold-storage holdings, grains, hay, feeds, seeds, and cotton, and the price situation and price movements of agricultural products.

Grade, staple length, and tenderability of cotton in the United States, 1928–29 to 1932–33 (*U. S. Dept. Agr., Statis. Bul. 47 (1935), pp. 112, figs. 11*).—The information in this bulletin supplements that previously noted (E. S. R., 70, p. 707), and presents detailed figures on grade, staple length, and tenderability of cotton ginned from the 1932 crop and of cotton on hand August 1, 1932 and 1933.

List of periodicals containing prices and other statistical and economic information on fruits, vegetables, and nuts, compiled by E. M. Colvin (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 55 (1935), pp. [2]+238+[4]*).—This mimeographed list "is designed to show the sources of prices and other statistical and economic material relating to fruits, vegetables, and nuts in the periodicals currently received in the United States Department of Agriculture Library."

Consumption of fruits and vegetables in the United States: An index to some sources of statistics, compiled by M. I. Herb (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 56 (1935), pp. [1]+II+125+[4]*).—This is a mimeographed index to some sources of statistics of consumption of fruits and vegetables in the United States. The statistics contained in the list "are described in detail, giving for each commodity named the area and period of time covered in the study, and the type of consumption—whether total, per capita, per family, or per adult equivalent."

Present day tendencies of production and consumption of margarine, H. Böker (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Rome], 25 (1934), No. 12, pp. 517–541*).—The production and consumption of margarine in the chief consuming countries, the quantities of raw material used, the imports and exports of butter, margarine, and vegetable oils used in the manufacture of margarine, and the competition between margarine and butter are discussed.

Cold-storage holdings (*U. S. Dept. Agr., Statis. Bul. 48 (1934), pp. 43, fig. 1*).—"This is the seventh of a series of bulletins published biennially on cold-storage warehouse space and cold-storage stocks of fruits, dairy products, eggs, dressed poultry, meats, lard, and fish" (E. S. R., 69, p. 612). It brings the data up to December 31, 1933, and shows the capacity of refrigerated warehouses as reported by a survey of October 1, 1933.

RURAL SOCIOLOGY

Iowa's population prospect, P. K. Whelpton (*Iowa Sta. Res. Bul. 177 (1934), pp. 113–168, figs. 5*).—The factors affecting the population of Iowa are analyzed, and the probable trend for the next 50 yr. is forecasted.

The first Federal census of Iowa, taken in 1840, showed a population of 43,112 persons. Forty years later the population was 1,624,615. In the last 50 yr. growth in population has progressed at a much slower rate than formerly, the 1930 population being 2,470,939. Most of this gain of 846,324 persons took place between 1880 and 1900, for there was a small decline in numbers from 1900 to 1905, and a rise of only about 261,000 from 1905 to 1930. The causes of this slowing-up process are discussed, and a prediction of 2,894,000 in 1980 is made.

[**Standards of living of farm families in Oklahoma**], O. D. Duncan (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 205, 206*).—Data derived from a survey of 562 farm families in the north central wheat area are briefly noted.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Vocational agriculture in relation to economic and social adjustments (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 177 (1934), pp. XVIII+67*).—This is a report of a conference (May 14–18, 1934) of State vocational supervisors and teacher trainers in agriculture and representatives of emergency Federal services, called by the Commissioner of Education, U. S. Department of the Interior, "to consider in detail the objectives, procedures, and rationale of the governmental adjustment measures—agricultural and other—and the ways in which established agencies of vocational education and farm organizations are cooperating and can cooperate in these programs."

Vocational education in various foreign countries, 1933 (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 40 (1935), No. 1, pp. 92–98*).—The developments in vocational education in various countries and the international developments in 1933 are described briefly.

FOODS—HUMAN NUTRITION

A history of food adulteration and analysis, F. A. Filby (*London: George Allen & Unwin, 1934, pp. 269, figs. 10*).—This volume, which contains a foreword by B. Dyer, traces the history of food adulteration and its detection and control in England from early in the twelfth century to the present. The entire time covered is divided into three periods, (1) from the earliest times to about 1820, a period marked by little and very slow development in either adulteration or detection; (2) a period of nearly a century when both adulteration and its detection came very much to the fore; and (3) the present period in which, according to the author, "the grosser forms of adulteration have been completely abolished and the lesser ones held severely in check."

The subject matter is presented in chapters on the grocers, the bakers, the brewers, the vintners, the distillers, food analysis (being the beginning of organic analysis), and later developments. Many quotations from early literature are included in the various chapters and are also given as appendixes. There is an annotated bibliography of the more important manuscripts and printed works used in the preparation of the text.

The evolution of nutrition, J. G. Archibald (*Jour. Chem. Ed., 11 (1934), No. 11, pp. 601–608*).—This is a concise review of the development of the

science of nutrition from the beginning of the nineteenth century to the present time.

Food and nutrition [at the Hawaii Station] (*Hawaii Sta. Rpt. 1934, pp. 27–30*).—This progress report (E. S. R., 72, p. 413) includes brief summaries of studies on the iodine content of 18 of the principal fish and 12 of the most widely used seaweeds of Hawaii; the chemical nature of the poisons in three Hawaiian plants, pamakani (*Eupatorium glandulosum*), akia, and air plant and of the components of the juice of passion fruit responsible for its keeping quality; and the vitamin content of Hawaiian foods, including vitamin B in fresh daikon, vitamins A and D in the opihi (Hawaiian limpet), vitamins A, B, C, and G in the papaya and in figs, vitamins A, B, and C in pohas, vitamins A and C in guava jelly and guava juice as an antiscorbutic for babies, vitamin B in tofu (soybean curd) and vitamins A, B, and G in miso (fermented soybeans and rice), vitamins A, B, and G in lotus root, and vitamins A, D, and G in chirimen-iriko, a small dried fish used by the Japanese. Anemia studies in cooperation with C. J. Hamre and a study of the proteins of the pigeonpea are also noted briefly.

Progress of research on nutrition in India, including work on vitamins, S. RANGANATHAN (*Biochem. and Allied Res. India, 1933, pp. 57–71*).—This progress report summarizes briefly, with footnote references to the original papers, nutrition researches in India during 1933. The topics include vitamins and vitamin synthesis, deficiency diseases, general nutrition and nutritive value of foodstuffs, metabolism, and biochemical and biophysical studies.

The calcium and phosphorus content of some Alabama vegetables, E. R. BISHOP (*Jour. Nutr., 8 (1934), No. 2, pp. 239–245; abs. in Alabama Sta. Rpt. 1933, p. 30*).—In this contribution from the Alabama Experiment Station, data are reported on the calcium and phosphorus content of various field crops grown at the station with 1,000 lb. per acre of complete fertilizer. The materials analyzed included dried lima beans, greenhouse nonheaded and field headed cabbage and Chinese cabbage, field chard and collards, greenhouse lettuce and mustard, field New Zealand spinach, field onions (tops and bulb), dry cowpeas, field green peppers, Irish potatoes and sweetpotatoes, greenhouse radish tops, greenhouse and field tendergreens, field tomatoes, and greenhouse and field turnip tops (American and Japanese). Data are also reported for cabbage and lettuce grown on acid soils low in calcium but receiving varying amounts of superphosphate.

Wide differences were found in the content of both calcium and phosphorus in a given vegetable. In general, the calcium content was low and the phosphorus high as compared with standard values, but lettuce, mustard, and potatoes were low in phosphorus as well as calcium, and onions and peppers relatively high in calcium. The calcium and phosphorus also showed a tendency to vary inversely. Japanese varieties of turnips were consistently lower in calcium than American varieties grown under the same conditions, but with this exception the variations with variety or age were not significant. The plants grown with increased amounts of superphosphate showed regular increases in phosphorus but only small changes in calcium, the extent of the variation differing with the vegetables and the soil.

Dry skimmilk—how to use it, A. M. CHILD (*Minnesota Sta. Bul. 313 (1934), pp. 24*).—Following a brief discussion of the food value, cost, keeping qualities, and methods of using dry skim milk, recipes are given illustrating its use as a substitute for fluid milk in low cost diets and as a means of increasing the food value of various types of cooked foods. It is noted that each tablespoonful of dry skim milk used in a product increases its food value by 25.7 calories, protein 2.51 g, lactose 3.45, ash 0.573, calcium 0.099, and phosphorus 0.077 g.

The effect upon the gastric juice secretion of various cooked preparations of haddock (Melanogrammus aeglefinus) and of lobster (Homarus americanus), A. ALLEY (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 3, pp. 182–184, figs. 2*).—In this investigation the foods tested, which included boiled lobster and boiled, baked, fried, and smoked haddock, with raw beef heart as control, were fed to a dog with a so-called Armour pouch from which the gastric secretion was collected hourly for analysis.

The haddock muscle prepared in various ways stimulated different types of gastric secretion. The baked fish incited a secretion of greatest duration and volume, highest pepsin and mucin content, and lowest free acidity; the boiled fish, one of decreased volume and content of pepsin and mucin; the smoked fish, one of large volume and greatly increased total acidity, but low pepsin and mucin content; and the fried fish, one of low free acidity and somewhat reduced pepsin and mucin. Boiled lobster proved to be a much stronger stimulus than boiled haddock for volume of secretion and also acid, pepsin, and mucin content, but the duration of the secretion was much shorter.

It is suggested that these findings may be of value in the elaboration of diets for securing a decrease or increase of gastric secretion as an aid in the treatment of various disorders of gastric function, especially those of the lesser curvature.

Feeding experiments with mixtures of highly purified amino acids, IV, V, C. T. CALDWELL and W. C. ROSE (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 45–73, figs. 7*).—In continuation of the series noted previously (E. S. R., 67, p. 339), two papers are presented.

IV. *The supplementing effect of casein fractions obtained by the carbamate procedure* (pp. 45–55).—Fractionation of hydrolyzed casein by the carbamate procedure and tests for the growth stimulating effects of the different fractions when introduced into a basal diet containing a mixture of highly purified amino acids as the only other source of nitrogen showed that the unidentified growth essential of casein is associated with the monoamino acids whose carbamates are soluble in ice water. As the carbamate of glycine is relatively insoluble in ice water, it may be removed from concentrates of the growth stimulant. It is thought that this separation will prove to be of considerable value in the purification of the unknown substance, since glycine is one of its usual contaminants.

V. *Additional properties of the unknown growth essential present in proteins* (pp. 57–73).—In order to learn more of the properties of the unidentified growth essential in proteins, hydrolyzed casein was fractionated by the copper salts method, as described by Klabunde (E. S. R., 66, p. 711), and the various fractions were tested biologically as in the study noted above.

The tests showed that the copper salt of the unknown substance is very readily soluble in water and only slightly soluble in absolute methyl alcohol. It yields neither an insoluble picrate nor picrolonate. The more important properties of the essential are tabulated.

Proteins versus the carbohydrates: An inquiry into their gastric digestion, M. E. REHFUSS (*Jour. Amer. Med. Assoc., 103 (1934), No. 21, pp. 1600–1605*).—This paper reviews earlier studies of the author and various associates on the gastric response to foods (E. S. R., 44, p. 665), and presents a series of clinical observations which effectively explode the present dietary fad of incompatibility of proteins and carbohydrates as part of the same meal. Fifty patients suffering from nearly as many types of chronic disease were first given a test meal of 100 g of hamburger steak, on the second day the same amount of meat with 100 g of mashed potatoes, and on the third day the same

amount of meat and potatoes with 40 g of butter. Data were obtained on the emptying time of the stomach and free and total acidity of the gastric contents on the three types of meals. For the entire series the evacuation time was 3 hr. 51 min. for the meat alone, 3 hr. 54 min. for the meat and potatoes, and 4 hr. 2 min. for the meat, potatoes, and butter (protein, carbohydrate, and fat). The average values for free acidity were, respectively, 28, 33, and 32.4 and for total acidity 69.7, 76.2, and 79.1 percent of N/10 alkali required to neutralize 10 cc of juice.

"These observations, representing a year's work in a medical service, demonstrate better than any mere words can express the absolute inaccuracy of the statement that proteins and carbohydrates are incompatible in the stomach. They show without question that the stomach, even in the diseased individual, proceeds in orderly fashion to break up the meat fibers and initiate the first stage of protein digestion in the stomach. Furthermore, a study of these specimens proves beyond any question that there is an orderly mechanical subdivision of carbohydrates so as to facilitate intestinal digestion."

Cause of laxative effect of feeding bran pentosan and cellulose to man, W. H. Olmsted, G. Curtis, and O. K. Timm (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 1, pp. 141, 142*).—To compare the laxative properties of the crude fiber and pentosans of bran and also to determine whether the laxative effect of bran is due entirely to the additional unabsorbable matter and water in the feces or to a possible stimulating action to the intestines of the fatty acids formed by the action of bacteria on digestible and nondigestible carbohydrates, two persons with normal colons (as far as could be judged by X-ray studies) served as subjects. In the first of four feeding periods of 7 days each a nonresidue basal diet was consumed alone. In the other three periods the diet was supplemented, respectively, with 35 g daily of a crude bran preparation containing 40 percent of pentosans by weight; the same quantity of a bran preparation containing 50 percent of crude fiber; and apples, apricots, and prunes.

The stools were analyzed for pentose, fiber, and volatile acids. During the period in which the diet was supplemented with pentosans there was no increase in the volume of the stool or the output of volatile fatty acids, and only 17 and 6.5 percent, respectively, of the pentosans were recovered in the stools. In the crude fiber test the volume of the stools increased 100 percent in one subject and 88 percent in the other and the fatty acids 56 and 74 percent, respectively. The fiber content of the feces amounted to 102 and 95 percent of that fed. In the final period during which fruits were added to the diet there were definite increases in stool volume and quantities of volatile fatty acids.

"The pentosans of bran are not laxative, while bran fiber is definitely so. The volatile fatty acids parallel the volume of the stool and are not increased by the breakdown of pentosan."

Fat and calcium metabolism, [I], II, A. Westerlund (*Lantbr. Högsk. Ann. [Uppsala], 1 (1933–34), pp. 1–19, figs. 5, Swed. abs., pp. 17–19; 21–23, fig. 1, Swed. abs., pp. 29–31*).—Two papers are presented.

I. *The influence of tripalmitin and triolein upon the fecal output of Ca in full-grown rats.*—The influence of pure tripalmitin and pure triolein on calcium elimination was tested by balance experiments with full-grown rats on diets differing only in the proportion of the two fats. Statistical treatment of the data, with calculations of net regression coefficients for the separate co-variations between the experimental factors and the fecal output of calcium, has led to the conclusion that the "consumption of tripalmitin exercises a deleterious influence upon the calcium metabolism by raising the amounts

of fecal calcium considerably higher than the corresponding calcium intake, thereby bringing the animals into a profuse negative calcium balance. Such an influence cannot be attributed to the consumption of triolein."

II. *The influence of tributyrin upon the fecal output of Ca in full-grown rats.*—A similar study of tributyrin is reported, with the conclusion that it resembles triolein in that moderate consumption has no deleterious effect upon the calcium utilization of full-grown rats.

The relation of iron and copper to the cytochrome and oxidase content of animal tissues, E. Cohen and C. A. Elvehjem (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 97–105*).—This continuation of studies on the action of copper in the animal body (E. S. R., 70, p. 872) has been essentially noted from a preliminary report (E. S. R., 71, p. 882). In discussing the findings, attention is called to the demonstration that copper is associated with other hematin compounds than blood and that more copper is required for A cytochrome formation than for slow hemoglobin regeneration. This is thought to suggest that in the treatment of certain anemias the hemoglobin may show a fair response without a complete regeneration of normal respiratory processes.

"The close correlation between copper and oxidase activity suggests that copper is very essential in maintaining normal activity of this enzyme. At the present time it is difficult to determine whether a reduced oxidase activity is the cause of the changes in the cytochrome or changes in the cytochrome affect the action of oxidase. In either case the changes in cytochrome A concentration are closely correlated with oxidase activity. It is also impossible to determine whether the changes which we have observed in cytochrome and oxidase are sufficient to account for the animal's inability to form hemoglobin. However, it is entirely possible that copper is concerned with the normal functioning of general body activities and that its most easily detected effect is the change in the blood hemoglobin."

Factors influencing the utilization of the iron and copper of egg yolk for hemoglobin formation, W. C. Sherman, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 289–295, figs. 2*).—In an effort to explain the discrepancy shown by egg yolk alone among a number of food materials tested between the bipyridine method and the animal feeding method for determining the availability of iron for hemoglobin regeneration (E. S. R., 71, p. 130), the value of egg yolk as a source of both iron and copper for anemic rats was studied, with the conclusion that unavailability of copper rather than iron is involved, possibly through the formation of insoluble cupric sulfide in the digestive tract. It is noted that the results with egg yolk substantiate the observations of Rose, Vahlteich, and MacLeod (E. S. R., 71, p. 725), who showed that copper was the limiting factor in blood regeneration on egg yolk.

The availability of copper in various compounds as a supplement to iron in hemoglobin formation, M. O. Schultze, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 735–744, figs. 2*).—The possibility that copper as well as iron may not be readily available to the organism for hemoglobin formation was tested by feeding various organic copper compounds carefully purified from uncombined copper in amounts furnishing 0.05 mg of copper daily to young rats which had become anemic on a milk diet. Iron was also administered in amounts of 0.5 mg daily.

Of the compounds tested, copper caseinate, glycine amide biuret, alanine amide biuret, and hemocyanin from *Limulus polyphemus*, the copper was readily utilized, while under the same conditions copper hematoporphyrin was not utilized even when fed at high levels. Whole wheat was also tested at levels furnishing 0.01 mg of copper daily, and it proved to be as readily available as the same quantity of copper administered as copper sulfate.

In the opinion of the authors, the application of the biological method to the study of the availability of copper in natural food materials is difficult on account of the possibility that some but not all of the copper in the foodstuff may be present in available form and that the addition of natural food materials to an exclusive milk diet may improve the condition of the anemic rats through factors other than copper.

Injections of sodium fluoride on enamel and dentin of the incisor of the rat, I. SCHOUR and M. C. SMITH (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 1, pp. 1, 2*).—This is a brief summary of the principal findings in an investigation noted previously from another source (E. S. R., 71, p. 889).

Physical measurements of Mexican children in American schools, H. T. MANUEL (*Child Devlpmt., 5 (1934), No. 3, pp. 237–252, figs. 3*).—This paper reports an analysis of some of the data obtained in measurements (without coats, sweaters, and shoes) of height, weight, width of shoulders, depth of chest, and arm girth of Mexican children in the elementary school grades of Laredo and El Paso, Tex. Of the 1,863 boys from 5 to 17 yrs. of age, 18.7 percent were classified as of light, 40.3 percent of medium, and 41 percent of dark skin color. Corresponding figures for the 1,815 girls of the same age group were 25.3, 36.7, and 38 percent, respectively.

The heights and weights (with fixed allowance for indoor clothing) of the children corresponded closely with similar data reported from Mexico, except in the case of girls of the ages of 13, 14, and 15 yr., who were somewhat smaller in the present study. The boys, on the other hand, were slightly heavier than the group studied in Mexico.

In comparison with the Baldwin-Wood tables, the Mexican children in the present study were about 2 in. shorter, age for age, and from 4 to 7 lb. lighter. Similar tables for Mexican children have been prepared from the present data, but attention is called to the fact that the figures for girls about 12 yr. of age and boys at 15 yr. are probably not fairly representative of the total population.

The curves of growth by sex show that except in width of hips the measures of the boys are generally greater than those of the girls up to the age of 10 or 11 yr. The curves cross at 11 or 12 and recross at 13 or 14 yr. There is some indication from the measurements that the Mexican children mature somewhat earlier than the children of the Baldwin-Wood tables.

Breast and artificial feeding: Influence on morbidity and mortality of twenty thousand infants, C. G. GRULEE, H. N. SANFORD, and P. H. HERRON (*Jour. Amer. Med. Assoc., 103 (1934), No. 10, pp. 735–739, figs. 10*).—An analysis is reported of the morbidity and mortality records as related to type of feeding of 20,061 infants under the care of the Infant Welfare Society of Chicago for as long as 9 mo. during the years 1924 to 1929, inclusive. Of the entire number, 48.5 percent were totally breast-fed, 43 percent partially breast-fed and 8.5 percent artificially fed.

As regards total morbidity and mortality, and both morbidity and mortality from respiratory, gastro-intestinal, and unclassified infections, the artificially fed infants had the highest and the breast-fed infants the lowest percentages.

"It will be observed that in every instance, from the point of view of feeding, breast feeding gives a much greater immunity to infections than artificial feeding. It is shown that even a partial breast feeding gives considerable immunity. Roughly, it shows that, baby for baby, the breast-fed infant will have a 50 percent better immunity than one that is artificially fed."

Effect of various dietary principles on lactation in rats, R. G. DAGGS (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 1, pp. 194, 195*).—In this pre-

liminary report the results are summarized of the effects upon lactation in rats of feeding various supplements to a basal diet of casein 15, salt mixture 5, agar 2, starch 76, and lard 14 parts, with wheat germ oil 5 drops, cod-liver oil 6 drops, and irradiated yeast 3 g per day. The criterion selected was the growth of the litters during the fourth to the seventeenth day of life. The logarithmic functions of daily weight during this period of litters of 6 were plotted against time and the slopes of the resultant curves expressed as lactation indices.

Good results were obtained with liver, egg, the water extract of autolyzed liver or egg, casein at a 25 percent level, Witte's peptone, blood fibrin, and cystine, and poor results with extra lard, liver, egg fat, or wheat germ oil, the unsaponifiable fractions of liver or egg fat, and lecithin.

Health and the economic depression in the United States of America, I, II, H. S. Cumming (*League Nations Health Organ. Quart. Bul., 3 (1934), No. 1, pp. 32–48, figs. 4*).—This report is presented in two parts.

I. *Illness in families of wage-earners in five surveyed cities in the early part of 1933* (pp. 32–43).—A survey of the incomes and extent of illness of families of wage earners in the poorer districts of five cities in the separate years of 1929 to 1932 and the early part of 1933 showed that a relatively large drop in economic status was associated with higher illness rates. It was thought impossible, however, to make any estimate from the results of this survey of the number or percentage of the entire wage-earning population that has suffered increased illness during the depression.

II. *Nutrition of school children* (pp. 43–48).—This is a summary of the previously noted investigation by Palmer (E. S. R., 70, p. 723), and of the data obtained in physical examinations of 406 children in Pittsburgh and 508 in New York City in families included in the general illness survey noted in part 1.

In the families of the present study whose annual per capita income was less than $250, 31 percent of the Pittsburgh and 21 percent of the New York children were classified as having good, and 15 and 36.5 percent, respectively, poor nutrition. In the families with a per capita income of $250 or more the corresponding values were 47 and 35 percent with good and 4 and 3 percent, respectively, with poor nutrition. The children whose family income remained unchanged during the 4-yr. period, 1929–32, had a higher percentage of good nutrition than those whose family income had dropped to a low level.

Further studies on growth and the economic depression, C. E. Palmer (*Pub. Health Rpts. [U. S.], 49 (1934), No. 49, pp. 1453–1469, figs. 7*).—This continuation of the series of papers noted previously (E. S. R., 70, p. 723) deals with a comparison of weights and weight increases of elementary school children in the same city in 1933–34 with the previously reported data for 1921–27.

The average weights of the children showed no consistent or striking differences in the two periods. The variability of body weight as measured by standard deviation was not significantly different for the boys, but showed greater differences for the girls, in 1933 and 1934 than in the earlier period. The proportion of boys 12 percent or more below average weight did not increase in 1933 or 1934, but the proportion of girls in this group was slightly higher both in 1933 and 1934 than in the earlier period.

The average annual gains in weight for 1933–34 for all groups amounted to 91.5 percent of those for 1921–27. This percentage was the same as calculated in the earlier study for the year 1924–25 as compared with the entire period of 1921–27. "This finding, together with the fact that the actual weight of children has not decreased in the past decade, is taken as evidence that the recent economic depression has not materially affected the growth in weight of a representative sample of school children. A supplementary study of the

weights and weight increments of children from families in different levels of economic status in 1933 and 1934 shows that approximately the same differences are to be found as have been observed in times previous to the depression. From this it is concluded that there has been no obliteration or widening of class differences during the depression."

The influence of previous exercise upon the metabolism, the rectal temperature, and the body composition of the rat, K. HORST, L. B. MENDEL, and F. G. BENEDICT (*Jour. Nutr.*, 7 (1934), No. 3, pp. 251–275).—This paper and the one which follows report various phases of the comprehensive metabolic study of the rat, an earlier phase of which has been noted previously (E. S. R., 65, p. 98).

Moderately severe exercise was found to produce an immediate temporary increase in oxygen consumption and in body temperature. Severe exercise increased the basal metabolism per square meter of body surface in grown male rats. In terms of body weight, however, there was no significant difference between the metabolism of the exercised rats and the controls during both growth and adult life. Prolonged moderate exercise did not modify the basal metabolism of either growing or adult rats, whether calculated in terms of body weight or body surface, under the conditions of the experiment involving exactly the same food and the same original weights for the experimental and control animals.

"The basal metabolism of both groups of exercised rats and of the controls decreased with advancing age. The severely exercised rats (5,486 m daily for 120 days) consumed only about 24 percent more food than the nonexercised rats. On the basis of fresh weight the bodies of the exercised rats contained 3.5 percent less fat and 3 percent more water than the bodies of the nonexercised rats. On the dry basis, the exercised rats had an ash content 1.58 percent higher, a nitrogen content 0.78 percent higher, and a fat content 6.4 percent lower, on the average, than the nonexercised rats. Variations in basal metabolism were not directly related to differences in ash, nitrogen, and fat content."

The effects of some external factors upon the metabolism of the rat, K. HORST, L. B. MENDEL, and F. G. BENEDICT (*Jour. Nutr.*, 7 (1934), No. 3, pp. 277–303, fig. 1).—The factors investigated were the time of day, darkness or light, sex and age, and environmental temperature.

Diurnal variations were quite marked. The 24-hr. heat production of 8 rats per 200 g body weight, as determined from oxygen consumption measured between 2 a. m. and 10 p. m., was from 13 to 31 percent above the basal heat production calculated from the oxygen consumption between 10 a. m. and 4 p. m. Changes from daylight to darkness during these hours did not affect the metabolism.

The metabolism of adult male rats increased about 7.3 percent and of young growing male rats 3.8 percent per degree rise in environmental temperature up to 30° C. The rectal temperatures of the adult males averaged 37.7° at an environmental temperature of 17° and 37.3° at 30°, while the rectal temperatures of young growing male rats were practically the same, 38° at 20°, 25°, and 30° environmental temperature. "At thermic neutrality the metabolism of female rats was lower than that of males, both at young and adult ages, and with both sexes the metabolism decreased with age."

Investigations on heavy muscular work, E. HOHWÜ CHRISTENSEN, A. KROGH, and J. LINDHARD (*League Nations Health Organ, Quart. Bul.*, 3 (1934), No. 3, pp. 388–417).—The studies reported were undertaken under the auspices of the Health Organization of the League of Nations as a part of an extensive investigation to be conducted in different countries under similar and well-

controlled conditions on various problems connected with the physiology of athletics and maximal work. One purpose of the investigation was to determine whether or not various athletic sports involving great effort will in the long run be of beneficial or detrimental effect on the organism. The reports of the various phases of the investigation include brief reviews of previous work and summaries of new findings. The topics studied, with the names of the investigators chiefly responsible for each, are as follows: The heat regulation and the respiration, both by M. Nielsen; the respiratory metabolism, by O. Böje and O. Hansen; the influence of diet on the capacity for work, by O. Hansen; the blood sugar during work, by O. Böje; the lactic acid in the blood, by O. Bang; the oxygen supply in work of maximum intensity, by O. Böje, O. Hansen, and M. Nielsen; and kidney function and muscular work, by F. G. Govian.

The conclusions drawn from the study of the influence of diet on the capacity for work are as follows:

"Trained subjects will do light and moderate work by catabolizing both carbohydrate and fat in proportions determined by the preceding diet and nearly the same as during rest. In heavier work an increasing percentage of carbohydrate is catabolized. The reason for this appears to lie in a better utilization of carbohydrate and a higher caloric value of the oxygen utilized for carbohydrate combustion compared with fat combustion. The oxygen requirement is reduced by 15 percent, and this in its turn reduces the strain on the heart. When long continued severe work is to be performed, the preceding diet must provide ample energy, mainly in the form of carbohydrate, to fill up the stores of glycogen. When the absolute maximum of work is to be attained, e. g., in sporting contests, about 2 days' rest is required to secure a complete filling up of the glycogen stores, and it appears that this cannot be done by taking large amounts of carbohydrate just prior to the work."

The report concludes with suggestions for the rational training of individuals to perform heavy or maximum muscular work for brief periods and for periods of several hours' duration.

Second Conference on Vitamin Standardization (*League Nations Health Organ. Quart. Bul., 3 (1934), No. 3, pp. 428–440*).—This complete report of the second international conference on vitamin standardization, which has been noted previously from a preliminary report (E. S. R., 71, p. 740), includes for each of the vitamins, A, B, C, and D, a description of the international standard, a definition of the unit, the method of preparation (except for D), and distribution. There are also included for vitamin A, a description of the spectrophotometric test for assay of the vitamin in liver oils and concentrates, data on the properties of pure β-carotene, and a discussion on the adoption of a subsidiary standard of reference; for vitamin B, recommendations for future research; for vitamin C, the method of use and physical and chemical properties of the new standard (ascorbic acid); and for vitamin D, recommendations for future research, particularly with reference to cod-liver oil as a subsidiary standard, recommendations for biological methods for estimating vitamin D, and physical and chemical properties of crystalline vitamin D (calciferol).

[Vitamin studies at the Alabama Station] (*Alabama Sta. Rpt. 1933, pp. 20, 22*).—This progress report (E. S. R., 71, p. 728) includes summaries of studies by G. A. Schrader on the ability of the vitamin B-deficient rat to utilize *d*-glucose and by W. D. Salmon and J. G. Goodman on the efficacy of fats in decreasing the vitamin B requirement.

Vitamin content of foods in relation to human nutrition (*Kansas Sta. Bien. Rpt. 1933–34, pp. 118, 119*).—This progress report (E. S. R., 69, p. 808) includes summaries of studies by M. M. Kramer of the vitamin A content of the yolk of hens' eggs as influenced by rate of production and by feeding to change

the color of the yolk, of the green leaves of dandelion, lambs-quarters, and curled dock, and of cherries; of the vitamin B (B_1) content of yeast breads made with various milling products of wheats; and of the vitamin A content of the colostrum of the dairy cow.

Vitamin studies, R. REDER (*Oklahoma Sta. [Bien.] Rpt. 1933–34 pp. 184–187*).—Included in this progress report are further results obtained in a study of the effect of a deficiency of vitamins B and G on the digestion and absorption of carbohydrates (E. S. R., 66, p. 704); a description of a simplified procedure for the determination of the vitamin B content of foods, with data on the vitamin B and G content of mung beans, kafir, and darso; and observations on the specific growth effect of vitamin B and the water intake of vitamin B-deficient animals.

[Vitamin studies at the Washington Station], E. L. BATCHELDER (*Washington Sta. Bul. 305 (1934), p. 41*).—In this progress report (E. S. R., 71, p. 279) preliminary data are given on the vitamin C contents of Delicious and Winesap apples of low and high leaf-fruit ratios, the influence of storage temperatures on the vitamin C value of Jonathan apples, and the vitamin C value of frozen blackberries.

Vitamins A and D in pediatrics [trans. title], W. KAUPE (*München. Med. Wchnschr., 81 (1934), No. 49, pp. 1885, 1886*).—Clinical reports are given, showing the remarkable effectiveness of a new trade vitamin A and D concentrate, Detavit, as a substitute for cod-liver oil for infants and young children.

Fat soluble vitamins.—XL, The growth method of determining vitamin A, C. A. BAUMANN, B. M. RIISING, and H. STEENBOCK (*Ztschr. Vitaminforsch., 3 (1934), No. 2, pp. 81–89; Ger., Fr. abs., p. 88*).—This continuation of the series of papers noted previously (E. S. R., 72, p. 380) reports a study of the relation of growth response and ophthalmia to graded doses of carotene in young rats on four basal diets deficient in vitamin A—the basal synthetic diet of Steenbock and Nelson (E. S. R., 50, p. 363), the same diet with the casein increased to 27 percent at the expense of the dextrin, the Sherman and Munsell diet (E. S. R., 54, p. 89), and the diet recently described by Baumann and Steenbock (E. S. R., 72, p. 418).

The feeding tests were carried out on rats 21–25 days of age and weighing from 38 to 50 g at the beginning of the experiment and not less than 70 or more than 125 g at the end of the depletion period.

The gains in weight during the depletion period varied to as great an extent among the animals on any one diet as on the different diets. The average gains were 56, 31, 71, and 65 g, respectively, and the extremes 20 and 101 g. A comparison of the rates of growth after adding the graded portions of carotene showed that 3γ a week was too small an amount to produce growth and that amounts larger than 20γ produced no further increases. Approximately 10γ gave the best results. More uniform results were obtained when the gains were calculated from the time the maximum weight during the depletion period was regained than when the calculations were made in the usual way from the beginning of feeding the supplement. With the new method of calculating, as satisfactory results were obtained in 3 weeks as in 5 weeks. The ophthalmic response of the animals on the lower levels of carotene differed from the growth response. Animals on 3γ per week showed symptoms of severe ophthalmia, as well as failure to grow, while those on 5γ showed equally severe symptoms of ophthalmia but grew as well as those receiving 10γ. The latter, however, showed no symptoms of ophthalmia.

The results are thought to emphasize the danger of expressing vitamin A assays in terms of rat units unless control experiments with a standard preparation or its equivalent are run at the same time, as recommended by

Coward et al. (E. S. R., 71, p. 5). "The most practical device thus far proposed for the comparison of data is the use of the international standard. When analyses consist of comparisons between a standard and an unknown the method of analysis becomes of secondary importance, although the exact physiological response to a given dose may vary with the conditions which obtain in any specific laboratory."

Nerve degeneration associated with avitaminosis A in the white rat, T. S. Sutton, H. E. Setterfield, and W. E. Krauss (*Ohio Sta. Bul. 545 (1934), pp. 29, figs. 6*).—A concise review of the literature on the development of the present concept of vitamin A in nutrition and on changes in the central and peripheral nervous systems in animals on various deficient diets, particularly those deficient in vitamin A, precedes the report of an investigation undertaken to clarify the situation with respect to the part played by a deficiency in vitamin A in producing nerve lesions. Early observations in the authors' laboratory of symptoms indicative of nervous disorders in rats on a vitamin A-deficient diet and preliminary studies to eliminate other possible etiological factors are described briefly.

A study of various technics for detecting nerve degeneration led to the adoption of the examination of formalin-fixed frozen sections in polarized light and between crossed Nicols as a highly satisfactory method, which has the advantage of being simple and rapid and not depending on the development of artifacts. The technic is described, and microphotographs are given to illustrate the sensitivity of the method.

The observations reported include the influence of carotene in doses of 1γ and 2γ on nerve degeneration in rats on diets otherwise deficient in vitamin A, the progress of nerve degeneration as compared with development of ophthalmia and changes in weight in rats on a vitamin A-deficient diet, the influence of high and low levels of vitamin A supplements on the nerve degeneration, and the extent of occurrence of nervous symptoms in rats on a vitamin A-deficient diet supplemented with varying levels of butterfat after cessation of growth and appearance of ophthalmia. In the first series of observations the sciatic nerve and spinal cord were examined and in the others the sciatic and femoral nerves. Several A-deficient diets were used but with no significant differences in results.

The animals receiving 1γ and 2γ of carotene were completely protected. There was no evidence of ophthalmia or nervous symptoms, and microscopic examination of the nerves showed no degeneration. In the animals receiving no carotene the nerve degeneration, as observed microscopically, occurred at about the same time as, or even earlier than, ophthalmia. The microscopic evidence of degeneration preceded the external symptoms and became very extensive before the latter were noted. Adequate doses of vitamin A supplements after depletion arrested the degeneration but did not relieve the external symptoms. Among the animals receiving various doses of butterfat after depletion of vitamin A reserves, none receiving 60 mg daily showed nervous symptoms, but nearly half of those receiving 45 mg and nearly all of those receiving 30 mg daily showed nervous symptoms. The 45 mg proved to be approximately a unit dose. It is noted that to obtain a high incidence of the nervous symptoms less than a unit dosage of vitamin A must be administered after depletion. The outward symptoms of the nervous disorders are described as follows:

"The early symptoms are characterized by a peculiar unsteady, weaving gait in the rear limbs. There is a definite lack of coordination rather than an actual paralysis in the early stages. Frequently, when the rats are moving about, the limb or limbs involved are abducted to a greater than normal degree.

The condition is usually unilateral, and in cases of bilateral involvement the symptoms are more pronounced in one limb. With the progress of the symptoms the ability to use the affected parts diminishes. The animal walks back on the heel, with little use of the digits. The muscles of the thigh and leg are flaccid, and the digits are usually flexed. We have never noted a spastic or convulsive condition. In this respect our observations differ from those of other investigators in their description of the symptoms of nerve degeneration in vitamin A deficiency. When the rat is moving about, the limb is frequently abducted to such a degree that the animal walks on the side of the heel rather than on the sole of the foot. When the animal is stimulated by pinching the tail or toes of the rear foot, only a feeble response is noted. The final result is an irreparable atrophy of the muscles of the thigh and leg."

The sparing action of fat on vitamin B, VI, VII, H. M. Evans, S. Lepkovsky, and E. A. Murphy (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 429–437, figs. 4; 439–442, fig. 1*).—In continuation of the investigation noted previously (E. S. R., 69, p. 468), two papers are presented.

VI. *The influence of the levels of protein and vitamin G.*—Unsuccessful attempts in Steenbock's laboratory to confirm the authors' previous work on the sparing relationship between fat and vitamin B led to a comparison of the diets used in the two laboratories. The chief differences in composition were the amounts of protein and vitamin G, both of which were considerably higher in the authors' diet, which also contained no carbohydrate as compared with 24 percent of sugar in the Steenbock diet. To determine whether the intake of protein or vitamin G or both was responsible for the differences, a series of five diets was used to vary the proportions of protein, vitamin G, and fat. A synthetic lard was also tested in comparison with natural lard as a source of fat.

On the vitamin B-free diets the most satisfactory growth took place when the diet furnished 50 percent lard, either natural or synthetic, together with both high protein and high vitamin G. With either high protein and low vitamin G or low protein and high vitamin G and 50 percent lard in both cases, the growth rates, although far from satisfactory, were better than with low protein, low vitamin G, and 50 percent lard or high protein, high vitamin G, and no fat.

The authors conclude that for fat to exert its optimal sparing action upon vitamin B, both protein and vitamin G must be high. "The coöperative action of protein, fat, and vitamin G to enable the rat to make considerable growth and to survive for a long time upon vitamin B-free diets is an example of the possible physiological interrelationship of these factors. Closer attention will have to be given the possible relationships of similar physiological factors in nutritional investigations."

VII. *The effectiveness of various natural fats in sparing vitamin B.*—The failure of Gregory and Drummond (E. S. R., 71, p. 278) to confirm the sparing action of fat on vitamin B when olive oil was used to the extent of 50 percent of the diet led to a comparison of the sparing effect of different fats and oils fed at this level in diets high in vitamin G and protein but containing no vitamin B.

It was found that the fats could be arranged in two groups according to their ability to spare vitamin B. The solid fats, with the exception of hydrogenated sesame oil, were definitely and strikingly superior to the liquid fats. The materials tested in decreasing order of their effectiveness were coconut oil, lard, Crisco (hydrogenated cottonseed oil), butterfat, synthetic lard, hydrogenated coconut oil, corn oil, olive oil, hydrogenated sesame oil, and sesame oil.

The influence of vitamin B_6 on hematopoiesis in experimental anemia of the albino rat, M. I. Smith and E. F. Stohlman (*Pub. Health Rpts. [U. S.], 49 (1934), No. 52, pp. 1569–1575, pl. 1, figs. 2*).—The disputed question of the anti-anemic properties of vitamin B_2 was studied by a comparison of the blood regeneration following anemia caused by phenylhydrazine injections in rats on a normal diet and a diet deprived of vitamin B_2.

In normal rats the anemia thus induced was found to be transient in character with complete recovery in about 10 days. In the absence of vitamin B_2 the progress of recovery was not affected materially, but the rate of regeneration was somewhat retarded, particularly if the iron intake was also restricted. Reticulocytosis, which was very marked in the early stages of recovery in normal rats, was less pronounced in the vitamin B_2-deficient group. However, the differences are considered to be so slight that "the conclusion seems justified that vitamin B_2 is not concerned with hematopoiesis in the white rat."

Ascorbic acid (vitamin C), A. H. (*Nature [London], 134 (1934), No. 3393, pp. 724, 725*).—This is a brief summary of a discussion of the chemical structure and synthesis of vitamin C and theories concerning its biological function, held at the 1934 meeting of the British Association for the Advancement of Science.

Isolation of vitamin C from vegetables and the relations between vitamin C and ascorbic acid, S. Maruyama (*Inst. Phys. and Chem. Res. [Tokyo] Sci. Papers, 24 (1934), No. 518, pp. 287–303, pls. 2, fig. 1; also in Bul. Agr. Chem. Soc. Japan, 10 (1934), No. 10–12, pp. 184–192, figs. 8*).—Using a slight modification of the Szent-Györgyi method of isolating ascorbic acid from natural sources, the author has obtained crystals from the suprarenal cortex of the ox, the juice of the Japanese radish (Daikon, *Rhapanus sativus*), the juice of a kind of Japanese lemon known as Natumikan (*Citrus aurantium*), and Japanese green tea. The analytical values, specific rotation, and chemical and physical properties of the crystals prepared from the various materials were those of pure ascorbic acid. The purified crystals from the first two materials proved effective in doses of 0.8 mg in curative tests on guinea pigs. Microphotographs are given of the crystals isolated from each of the materials.

Vitamin C in Delicious apples before and after storage, E. L. Batchelder (*Jour. Nutr., 7 (1934), No. 6, pp. 647–655, figs. 2*).—The vitamin C content of Delicious apples grown in the State was determined in the fall and in the winter and spring after having been stored at about 45° F. in a fan-ventilated cellar with a relative humidity of from 78 to 82 per cent (common storage) and at 32° in a commercial cold-storage plant (cold storage). The ranges of temperature were from 38° to 48° in common storage and from 30° to 34° in cold storage. For testing, the apples were washed, wiped, quartered, cored, and cut in radial sections, including the natural proportions of skin and flesh.

The apples tested in the fall were found to have a vitamin C content of from 0.04 to 0.05 Sherman unit per gram, or from 1.1 to 1.4 units per ounce. No loss of vitamin C could be detected in the apples after cold storage for from 3 to 6 mo., but a loss of about one-sixth or less of the original potency occured during the first 3 mo. and about one-fourth during the 6 mo. of common storage. The apples in cold storage also retained a better texture and flavor and showed less overripeness and spoilage than those in common storage.

In discussing the vitamin values, it is pointed out that Delicious apples, although having a relatively low vitamin C content as compared with some other varieties tested, may make an important contribution to the vitamin C content of the diet because they are relatively large in size and are usually eaten raw and unpeeled.

Refinements in X-ray technique for the estimation of vitamin D, B. O'BRIEN and K. MORGAREIDGE (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 1, pp. 113–117, figs. 6*).—In order to make it possible to take frequent X-rays in the method of determining vitamin D in curative tests suggested by Poulsson and Lövenskiold (E. S. R., 59, p. 293) and further elaborated by Bourdillon et al. (E. S. R., 68, p. 132), the authors have devised a special rat and film holder protected with lead shields which enables the operator to hold a nonanesthetized rat in position for X-ray photographing without endangering the hands. Each animal is checked before the test feeding period to establish the degree of rickets and at frequent intervals during the experimental period. The averages obtained in readings of the X-ray photographs by different workers are said to compare closely with either the line test or bone ash averages on the same animals. In illustration, data are given as obtained by the three methods on a series of 18 animals in determining the potency of an irradiated milk in terms of the international vitamin D standard solution.

Attention is called to differences in the degree and character of the initial healing induced by different antirachitic agents. Both line tests and X-ray photographs are given showing the differences between the healing obtained with irradiated milk and the international standard irradiated ergosterol solution.

Vitamin D assay by preventive biological test (*Jour. Assoc. Off. Agr. Chem., 17 (1934), No. 1, p. 69*).—A brief description is given of the method for determining vitamin D adopted by the Association of Official Agricultural Chemists at its 1933 convention as a tentative method applicable to fish and fish liver oils and their extracts and to materials used for supplementing the vitamin D content of feeds, but not applicable to irradiated ergosterol products or to irradiated yeast unless recommended for poultry.

Further evidence for the occurrence of vitamin E in soy bean oil, U. SUZUKI, W. NAKAHARA, and Y. SAHASHI (*Inst. Phys. and Chem. Res. [Tokyo], Sci. Papers, 24 (1934), No. 517, pp. 283–286, fig. 1*).—The earlier conclusion that soybean oil contains vitamin E (E. S. R., 72, p. 569) was verified by breeding tests on rats. Female rats were usually able to give birth to litters on a synthetic diet with soybean oil as the only source of vitamin E, although interruption of gestation accurred on a few occasions, suggesting that the amount of vitamin E in soybean oil is relatively low.

Some observations on food allergy, W. T. VAUGHAN (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 6, pp. 384–387*).—In this discussion, based upon the author's extensive experience, the distinction is made between major or "unfortunate" allergics who are sensitive to some daily constituent of the diet and minor or "fortunate" allergics who are sensitive to something to which they are exposed infrequently. Methods of allergic study are outlined briefly, including preliminary intracutaneous tests with a group of extracts of related substances, records of offending foods in the form of a food diary, and the author's new leucopenic index which is said to have a reliability of about 67 percent.

Food allergy in its relation to gastro-intestinal disorders, J. FRIEDENWALD and S. MORRISON (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 2, pp. 100–103*).—Gastro-intestinal food allergy is thought to be more common than is usually recognized. Following citations to the literature on the subject and a brief discussion of the symptomatology reported therein, personal observations from 20 proven cases are given in illustration of various digestive complaints definitely traceable to allergy to one or more foods and completely cured by removal of the offending foods from the diet.

Revised "elimination diets" for the diagnosis and treatment of food allergy, A. H. Rowe (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 6, pp. 387–392*).—This is a revision and extension of the author's elimination diets noted previously (E. S. R., 65, p. 890), with new menus and recipes and a discussion of the diagnosis of food allergy, the use of elimination diets, and desensitization to foods.

Some metabolic and nutritional aspects of chronic arthritis, R. Pemberton (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 7, pp. 438–441*).—The metabolic aspects discussed include delay in the normal delivery of certain constituents of the blood, especially oxygen and glucose, to certain tissues, gastro-intestinal dysfunctions and malformations, and edema of the soft tissues. The use of a diet low in carbohydrate but high in vitamins and proteins is discussed with reference to their effect on these disturbances. It is emphasized, however, that the therapy of arthritis does not depend exclusively on dietetics or on any other single concept or measure. In the author's opinion "a coordination of several lines of therapy based upon sound physiological premises should definitely control the disease in about 80 percent of all cases."

The management of chronic spastic constipation, H. G. Beck (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 6, pp. 393–398, figs. 6*).—In this discussion proper diet is emphasized as the most important factor in the treatment of constipation, and a diet list is given with general directions.

Mortality in diabetic children, H. J. John (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 3, pp. 180–182, fig. 1*).—A review of 214 cases in the author's practice from 1920 to 1934. Of the 186 children living, 48 have had diabetes 10 yr. or more. Of the 28 deaths, 11 were in the first, 3 in the second, and 4 in the third year of their diabetes. The importance is emphasized of giving insulin to diabetic children at the earliest possible moment after the diagnosis has been made.

A study of tissue respiration and certain reducing substances in chronic fluorosis and scurvy in the guinea pig, P. H. Phillips, F. J. Stare, and C. A. Elvehjem (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 41–61, fig. 1*).—Various lots of guinea pigs which had been fed a basal vitamin C-free diet supplemented by 1 cc of orange juice for 4 days preliminary to the experimental period were fed the basal diet supplemented by 3 and 6 cc, respectively, of orange juice alone and with 25 mg of fluorine as NaF per kilogram body weight. Another lot was fed the basal diet plus 12 cc of orange juice plus 25 mg of fluorine, and still another the basal diet plus pure ascorbic acid (1 to 2 mg daily for from 25 to 28 days). The animals were removed from experiment when positive symptoms of scurvy or fluorosis had appeared, and various organs were used for determinations of ascorbic acid, oxygen uptake, oxidase and dehydrase activity, and cytochrome.

The outward symptoms of fluorosis and scurvy were remarkably alike except for the infrequent occurrence of or absence in fluorosis of the subcutaneous and intermuscular hemorrhages characteristic of scurvy. Scurvy produced a decline in the amount of ascorbic acid per unit weight in all of the tissues examined, while fluorosis did not influence the ascorbic acid content of any of the tissues examined except the anterior lobe of the hypophysis, in which a consistent reduction of ascorbic acid was observed in the fluorine-fed animals. Both scurvy and fluorosis caused an increase in the amount of reducing substances reacting with iodine in the liver, had relatively little effect on oxygen uptake and cyanide inhibition, reduced the indophenol oxidase content and increased the glutathione content of the liver, and reduced the rate of oxygen uptake in the suprarenal tissue. The cyanide-inhibited

fraction of the oxygen uptake of the suprarenal tissue was low in the scorbutic animals but high in the fluorine-poisoned animals.

Neuritis, S. Cobb and H. C. Coggeshall (*Jour. Amer. Med. Assoc., 103 (1934), No. 21, pp. 1608–1617, figs. 4*).—The term neuritis is defined as "a painful degenerative process in any part of the peripheral neuron causing a functional loss, which, according to the anatomy involved, may be sensory, motor, or mixed." The principal types of neuritis, as thus defined, are grouped as generalized polyneuritis and localized neuritis. Under the former group, various diseases are classified under four causes—virus, bacteriotoxic, deficiency or metabolism, and chemical. The list of syndromes given under the deficiency or metabolism group includes, among others, pellagra, pernicious anemia, sprue, beriberi, pernicious vomiting, hunger edema, chronic colitis, recurrent polyneuritis, chronic progressive polyneuritis, and chronic bacillary disentery.

Attention is called to the importance of furnishing balanced diets in State aid to the needy. "Soup kitchens and bread lines can induce severe nervous and mental diseases if unbalanced diets are given out. The expense of giving adequate vitamins is small. The cost of feeding many people on an inadequate diet is great in future suffering and institutional care."

A study of obesity in an outpatient clinic, E. C. Beck and R. S. Hubbard (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 4, pp. 250–256*).—The following 860-calorie diet, furnishing 40 g each of carbohydrate and fat and 85 g of protein daily, has been used with success as an obesity diet in the out-patient clinic of the Buffalo General Hospital: Breakfast, skimmed milk ½ cup, 10 percent carbohydrate fruits ⅓ cup, 2 eggs, and 1 serving of lean meat (ham); lunch and dinner, choice of 1 serving of lean meat or fish or ½ cup of cottage cheese, ¾ cup of 5 percent carbohydrate vegetables, and ¼ cup each of 10 percent carbohydrate fruits and skimmed milk. Tea or coffee with no cream or sugar is allowed with each meal. The cost of the diet at the time of writing, April 1934, was $1.57 per week.

On this diet a group of 32 ambulatory obese patients, all but one of whom were women, lost an average of 1.8 lb. a week during the first 8 weeks and about half that amount thereafter. A part of the more rapid loss during the first few weeks was attributed to the previous water retention, which approached edema in a few of the subjects. No unfavorable physiological changes were produced by the diet, and the original symptoms of dyspnea, easy fatigue, edema, and hypertension present in varying degree at the beginning were cured or improved in approximately 99 percent of the cases.

Aluminum hydroxide in the treatment of peptic ulcer, I. H. Einsel, W. L. Adams, and V. C. Myers (*Amer. Jour. Digest. Diseases and Nutr., 1 (1934), No. 7, pp. 513–516, figs. 5*).—Colloidal aluminum hydroxide is recommended for the treatment of peptic ulcer. Based on thorough laboratory and clinical study, the authors advance as arguments for this form of therapy the rapidity with which symptoms are brought under control; the simplicity of the treatment, which quickly gains the patient's confidence; the complete absence of toxic symptoms; the return of the free acidity of the stomach to initial levels after the medication is discontinued, but with no stimulation of increased HCl output after primary action as is true of sodium bicarbonate; the increased secretion of mucin following the treatment and the complete absence of disturbances in acid-base balance.

The usual textbook method is followed in the preparation of the aluminum hydroxide which, however, must meet the following standards to be acceptable for use: "The aluminum hydroxide should be a creamy white gelatinous substance with a not unpleasant taste and cause no nausea when taken into the

stomach. It must be neutral to neutral red or phenolphthalein. It must have a combining power, when titrated with Topfer's reagent, of at least 100 cc 0.1 N HCl per 4 cc aluminum hydroxide."

The degree of antiscorbutic activity of ascorbic acid [trans. title], L. Randoin (*Compt. Rend. Soc. Biol.* [*Paris*], *116* (*1934*), *No. 16, pp. 4–6, fig. 1*).—Ascorbic acid obtained from paprika and purified by several recrystallizations was examined for its vitamin C potency in preventive tests with guinea pigs on the author's scorbutic diet previously described. The minimum protective dose was about 0.5 mg. A dosage of from 0.75 to 1 mg of the acid gave comparable results to 2 cc of lemon juice.

Intensive liver extract therapy of sprue, C. P. Rhoads and D. K. Miller (*Jour. Amer. Med. Assoc., 103* (*1934*), *No. 6, pp. 387–391, figs. 4*).—Similarities and differences between the symptoms and effective treatment of pernicious anemia and sprue are discussed, with the conclusion that "clinical sprue may arise in three ways—by dietary lack, by lack of the gastric enzyme that is absent in pernicious anemia, or by inability to absorb the product of the interaction of the first two. Clearly, any one of the three factors may be causative or any combination of the three may exist. Furthermore, differences in the relative importance of the part played by each of the three might account for variations in the clinical manifestations.

"In view of the facts presented, it becomes clear that the desideratum in the treatment of sprue is to place the product of the interaction of the dietary factor and the gastric enzyme, that is, liver extract, as near to the site of utilization as possible in as large amounts as may be required."

As illustration of the application of these conclusions to clinical practice, the reports are given of four cases of sprue which had proved refractory to the customary treatment but in which clinical cure followed intensive parenteral liver extract therapy.

Commenting on the customary and often ineffective treatment of sprue by dietary measures alone, the authors state that "the idea of treatment by diet of a gastro-intestinal disorder, such as sprue, is so thoroughly ingrained in the medical consciousness that it is difficult for it to abandon the conception of some beneficial quality of the diet, simply as a regimen. The foregoing discussion should serve to indicate that the occasional effectiveness of diet in the treatment of sprue is largely based on its ability to supply the water-soluble vitamin. Diet is, at best, an uncertain method of obtaining 'liver extract' for the internal economy of the organism. By the use of parenteral liver extract the obstacles of dietary defect, gastric dysfunction, and intestinal malabsorption are at once effectively surmounted."

TEXTILES AND CLOTHING

The physical properties of fabrics in relation to clothing, Parts I–III, C. P. Black and J. A. Matthew (*Jour. Textile Inst., 25* (*1934*), *Nos. 6, pp. T197–T224, figs. 3; 7, pp. T225–T240, pl. 1, figs. 4; 8, pp. T249–T276, figs. 9*).—Three papers are presented.

I. *A review of the literature.*—This review is presented under the headings of the function of clothing and how the body reacts towards it, heat transmission through fabrics, air permeability, and water vapor permeability, absorbency, drying. The main part of the review was prepared in November 1929, but an appendix brings the review up to the spring of 1934.

II. *Water vapour permeability of fabrics.*—A method for determining the permeability of fabrics to water is described, and data obtained with it are

reported for a series of linen fabrics of graduated openness of weave and a number of other fabrics of somewhat similar structure from different fibers, including bleached cotton, artificial silk, and wool.

Closeness of weave was found to have only a slight effect on water permeability, a slight decrease in permeability occurring with increasing closeness of weave. The same samples in the loom-state condition, after finishing, and after twice washing in a public laundry showed increasing permeability in the order finished, loom state, and laundered.

For fabrics of similar mesh but different materials, the order of increasing permeability was wool, cellular cotton, cotton mesh, linen mesh, and artificial silk mesh. The permeability appeared to be roughly proportional to the porosity and inversely proportional to the apparent density of the material. In the mesh fabrics, the factors having the greatest influence on permeability are thought to be the hairiness of the surface and the yarn interspaces.

"The conclusion drawn is that since the vapor permeability shows only very small changes with considerable variation in the nature and structure of the underclothing material, it can have but very small influence upon moisture removal from the body, and therefore cannot be accepted as a criterion of the suitability or otherwise of such a material for its purpose."

III. *Heat insulation by fabrics used as body clothing*.—This paper reports a series of experiments in which the kata thermometer (E. S. R., 53, p. 764) was used to measure the heat-insulating power and "cold feel" of fabrics used in garments worn next the skin. The insulating value was expressed by the ratio of the times taken by the kata to cool over its graduated range when clad with the fabric and when unclad, and cold feel by the initial rate of cooling induced in the warm kata when the cloth is first applied. The fabrics tested in order of decreasing cold feel were artificial silk mesh, linen mesh, cotton mesh, light cellular cotton, light wool, heavy cellular cotton, and heavy wool. The initial rates of cooling varied only between 0.17° F. and 0.14° per second, but these very small differences corresponded to a very distinct difference in the feel as actually experienced by the hand.

The insulating value was affected by the annular space, the value of which for maximum insulation was approximately the same for all of the materials tested; by the air movement, which at high speeds had the same effect for all materials; and by the moisture content, increases in which up to 75 percent decreased the insulating value.

Differences in material had less effect upon insulation than differences in annular spaces for a single material either wet or dry. Changes in thread count up to 30 per inch produced very little effect. The insulating power of a loom state ¾ white fabric decreased after finishing but recovered after laundering. The values for cold feel changed in the reverse direction.

"The general conclusion to be drawn from the results is that the insulation provided for the kata thermometer was determined, in the main, by such conditions as annular space, air movement, the moisture content of the cloth, and whether single or double layers were used. The nature of the material in the cloth and its mode of construction exerted a relatively minor influence under every condition tested. That material which is chosen to give the most suitable value of insulating power under a given set of physical conditions will make the most comfortable garment, if it also keeps the perspiring skin dry by suitable absorption and ventilation."

A study of factors affecting the service qualities of certain textile fabrics (*Kansas Sta. Bien. Rpt. 1933–34, pp. 120–123*).—Included in this progress report are summaries of studies by K. Hess and E. Bruner on the com-

parative strength, weight, and protective values of cotton and wool blanket materials; the effect of dry and moist atmosphere and of human and synthetic perspiration upon unweighted and weighted silk fabrics; the effect of different wave lengths of light upon the deterioration of certain unweighted and weighted silks; a comparison by the method noted previously (E. S. R., 72, p. 734) of the absorptive qualities of silk, rayon, and cotton knitted fabrics; and a study of the service qualities of certain cotton textile fabrics as affected by laundering.

Qualities of percale obtained on the market compared with the Government specifications, E. Bruner and S. H. Roberts (*Jour. Home Econ., 26 (1934), No. 5, pp. 286, 287; abs. in Kansas Sta. Bien. Rpt. 1933–34, p. 122*).—In this study at the Kansas Experiment Station, 6 samples of percale priced at 25 ct. per yard and guaranteed by the retailer to meet Government specifications under the Certification Plan were compared with 7 similar samples commonly sold at 17 ct. per yard not under the Certification Plan, but guaranteed by the salesman to be fast to sun and laundering.

All of the samples were within Government specifications for width and thread count. Eleven failed to meet the breaking strength specifications, but on the whole the fabrics carrying no guarantee as to Government specifications showed higher breaking strength than the guaranteed fabrics. Nine of the samples, including 5 supposed to meet Government specifications, exceeded the maximum weight per square yard, and 3 exceeded the maximum amount of sizing. Nine of the samples were fast to the light of the Fadeometer, but none of them was fast to the all-weather test. All were fast to laundering.

It is concluded that the fabrics supposed to be sold under the Certification Plan were of no better quality or appearance than the other comparable materials analyzed.

HOME MANAGEMENT AND EQUIPMENT

A primer of electricity and heat, M. M. Monroe (*Maine Sta. Bul. 376 (1934), pp. 287–321, figs. 9*).—This bulletin has been written to give the purchaser and user of electrical heating equipment an elementary understanding of the principles of the transportation of electrical power and its conversion into heat, and of heat transfer as an aid to wise choice and economical operation of such equipment. Clear, nontechnical explanations are given of the nature of electrical energy and its measurement; the transfer and control of electric power; heat transfer by conduction, radiation, and convection; physical and chemical changes produced by heat; and the transfer of heat through various types of utensils. A few simple diagrams and references to the literature add to the usefulness of the publication.

The optimum operating temperature for electric water heaters, E. H. Roberts (*Washington Sta. Bul. 305 (1934), p. 41*).—This progress report deals with the efficiency of various types of domestic water heaters and the optimum temperatures for their operation for different purposes.

A comparison of cooking equipment of the farm home (*Kansas Sta. Bien. Rpt. 1933–34 pp. 123, 124*).—This progress report (E. S. R., 69, p. 317) includes summaries of the results obtained by M. F. Taylor in studies of flame temperatures of different wick heights in kerosene stoves, the efficiencies of different types of top burners of gas ranges and the time required to use them under various conditions, and factors affecting oven operation.

MISCELLANEOUS

Forty-fourth Annual Report [of Alabama Station], 1933, M. J. FUNCHESS ET AL. (*Alabama Sta. Rpt. 1933, pp. 32, fig. 1*).—The experimental work reported is for the most part referred to elsewhere in this issue.

Alaska Agricultural College and School of Mines Agricultural Experiment Station, College, Alaska, 1933: Progress report, January–December, G. W. GASSER (*Alaska Col. Sta. Bul. 3 (1933), pp. [5]+39, figs. 14*).—The experimental work reported is for the most part noted elsewhere in this issue. Meteorological data are also included.

Report of the Hawaii Agricultural Experiment Station, 1934, [J. M. WESTGATE ET AL.] (*Hawaii Sta. Rpt. 1934, pp. 31, figs. 6*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

[Biennial Report of Kansas Station, 1933–34], L. E. CALL ET AL. (*Kansas Sta. Bien. Rpt. 1933–34, pp. 147, figs. 3*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of [Nevada Station], 1934, [S. B. DOTEN ET AL.] (*Nevada Sta. Rpt. 1934, pp. 54, figs. 7*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Applying science to agriculture: Report of Oklahoma A. and M. College Agricultural Experiment Station, 1932–34, C. P. BLACKWELL ET AL. (*Oklahoma Sta. [Bien.] Rpt. 1933–34, pp. 318, figs. 42*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Applied research contribution to Oregon's agricultural income: [Biennial Report of Oregon Station, 1933–34], R. S. BESSE (*Oregon Sta. Bul. 334 (1934), pp. 78, figs. 25*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-fourth Annual Report [of Washington Station], 1934, E. C. JOHNSON ET AL. (*Washington Sta. Bul. 305 (1934), pp. 78*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Arizona University and Station.—Dr. David Griffiths, professor of botany and botanist from 1900 to 1901 and subsequently connected with the U. S. D. A. Bureau of Plant Industry, died March 19 in Washington, D. C. Dr. Griffiths was born in Wales on August 16, 1867, coming to South Dakota at an early age and graduating from the South Dakota College in 1892. He received the M. S. degree from the same institution in 1893 and the Ph. D. degree from Columbia University in 1900.

Dr. Griffiths began in Arizona the extensive studies of grasses and other range plants and range management to which he devoted himself for 15 yr. with the Bureau of Plant Industry. His results showed the necessity for avoiding the overstocking of the ranges with resultant depletion of plant cover and destructive erosion and the economic importance of the cacti as forage plants and emergency forage reserves. Subsequently his work shifted to the feasibility of bulb production. According to a recent tribute by Dr. W. A. Taylor in *Science*, he soon became recognized as an unquestioned leader in this work and was "largely responsible for the progress thus far made in commercial bulb production in the United States." "Reared, and in the main schooled, close to the agricultural frontier of that time," as Dr. Taylor states, "Dr. Griffiths developed a rare combination of scientific accuracy in his research and sound common sense in the practical application of his discoveries. Indefatigably industrious and efficient, the work which progressively he undertook on fungi, grasses, cacti, and bulbs he put his whole soul into."

Georgia Station.—With the aid of FERA labor, two much-needed buildings have been added. At the main station a seed barn has been constructed of hollow tile and other fireproof materials, while at the Mountain Substation a community cannery has been built of native stone.

S. V. Sanford, president of the University of Georgia, has been elected chancellor of the State university system vice Philip Weltner resigned. H. L. Cochran has been appointed assistant horticulturist of the station effective July 1.

Kansas College and Station.—*Science* notes that Dr. Earl H. Herrick, head of the department of biology of the Louisiana State Normal College, has been appointed associate professor of zoology and mammalogist in the station to succeed the late Dr. George E. Johnson.

New Mexico College and Station.—Glen Staten has been appointed assistant professor and assistant agronomist vice W. T. Conway, resigned.

U. S. D. A. Committee on the Effect of Soil on the Biological Value of Dietary and Medicinal Plants.—This committee was established May 7, 1935, for the purpose of making a study of the present state of knowledge of this subject and to formulate suggestions for research. The committee consists of Dr. F. C. Blanck, Bureau of Chemistry and Soils, chairman; Dr. Oswald Schreiner, Bureau of Plant Industry; H. P. Barss, Office of Experiment Stations; Dr. C. E. Kellogg, Bureau of Chemistry and Soils; and Dr. Hazel E. Munsell and Charlotte E. Chatfield, Bureau of Home Economics.

EXPERIMENT STATION RECORD

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EDITORIAL

THE SEMICENTENNIAL OF THE MINNESOTA EXPERIMENT STATION

So widespread has been the tendency to think of the beginning of experiment station research as coincident with the enactment of the Hatch Act of 1887 that many do not realize that when this law was passed stations were already in existence in 18 States of the Union. The fiftieth anniversary for 11 of these had been reached prior to 1935, and 4 others—Indiana, Kentucky, Maine, and Minnesota—have attained or will attain this milestone during the current year. Announcement has recently been made of the projected observance of the occasion by the Kentucky Experiment Station on September 25, and the Minnesota Station brought its celebration to successful completion on June 13 and 14.

The Minnesota program was formally opened with a historical outline of the station, presented very appropriately by Dr. Andrew Boss, vice director since 1917 and associated with the university for nearly 40 yr. Dr. Boss ascribed the early origin of the station to the need for reliable information regarding the problems incident to the new environment which confronted the pioneers entering from other regions. This need found expression in an act, passed in 1858 by the first legislative session held after the organization of Minnesota as a State, providing for an agricultural college and experimental farm at Glencoe in McLeod County. For various reasons this plan was never carried into execution, and even a subsequent enactment in 1868 which authorized the university regents to secure suitable land for an experimental farm and led to the acquisition of a tract of 120 acres in Minneapolis also proved of little direct benefit until the appointment of Mr. Edward D. Porter of Delaware College as professor of agriculture in 1881 and the relocation of the farm the following year. Some experimental work was then begun, however, and in 1885 an act was passed by the legislature making it "the duty of the board of regents of the University of Minnesota as soon as practicable after the passage of this act to establish at said university an agricultural experiment station for the purpose of promoting

agriculture in its various branches by scientific investigations and experiments." This enactment marked the official beginning of the station, although because of limited financial support and inadequate staff little progress was made until the passage of the Hatch Act brought Federal funds.

The subsequent development of the station to its present position of prominence was recounted by Dr. Boss and supplemented by many reminiscences from President J. H. Shepperd of the North Dakota College, Mr. A. J. Glover, editor of *Hoard's Dairyman*, representatives of a number of State agricultural organizations, and others. In addition to these addresses, the evolution of the institution was depicted very effectively by exhibits illustrative of institutional and departmental achievements. A comprehensive historical account, likewise prepared by Dr. Boss and entitled Minnesota Agricultural Experiment Station, 1885–1935, was issued as Bulletin 319 and constitutes a substantial contribution which will do much to make the story of the half century more widely known.

Advantage was also taken of the opportunity to pay tribute to the work of Dr. Boss, whose approaching retirement from full service was announced, and to the memory of the late Dr. R. W. Thatcher, as well as to unveil a portrait in recognition of the notable leadership in dairying of the late Dr. C. H. Eckles. Nor was acknowledgment lacking of the accomplishments of others among the pioneers who, as one speaker expressed it, "entered the road to knowledge where it was little more than a woodland trail, rough and obstructed in spots, with many dark corners to be cleared, and the solid foundation still to be laid."

How capably this task was accomplished may be inferred from the many messages of felicitations which were received. Among these may be mentioned that of Dr. J. T. Jardine, pointing out on behalf of the Office of Experiment Stations that "the completion of so creditable a half century of achievement is an event of national interest. This is especially true," he went on to say, "of an institution which is notably forward-looking, and which is now pausing to pay tribute to the past, I assume, chiefly to gain inspiration and guidance for renewed efforts in the future."

This underlying purpose was significantly revealed in the address of Director W. C. Coffey, entitled The Need for the Experiment Station Now, in which he discussed specifically and constructively some of the outstanding problems awaiting solution. Director Coffey showed that far from being dominated by the motive of increasing production, as had sometimes been charged, the more prominent station objectives under present conditions are "to conserve land resources as a continuing source of wealth; plan the use of land, keeping in mind the need of adjusting production to demand; reduce the

costs of production and marketing; improve the quality and marketability of farm and forest products; and expand the use and market outlets for these products. These objectives pertain directly to land enterprises. There are others addressed to problems involved in rural home and community life. When the work of the experiment station is appraised on the basis of these objectives, it is clear that there was never greater need for it than now."

Special mention was made of problems in rural sociology, such as the plane of rural living following the depression and drought, the part-time farm, migration between farm and city, the increase in farm tenancy, submarginal areas from a social point of view, rural social institutions and organizations, and the new field of rural psychology. Director Coffey concluded that "in sum we are approaching a time when an experiment station to be most effective needs to have a planned, well-coordinated program in which all of the talent qualified to contribute to given problems is drawn together for concerted attack." Particularly he argued for increased cooperation between biologists and economists, and saw in the adaptability of the station organization to changing needs a condition which "causes me to have great faith in the future of our research program."

This broad outlook and vision found further recognition in a trio of what may be termed "general" addresses contributed, respectively, by Dr. R. Newton, director of the division of biology and agriculture of the National Research Council of Canada; Mr. F. A. Silcox, Chief of the U. S. D. A. Forest Service; and Dean Guy Stanton Ford of the Graduate School of the University of Minnesota. The address of Mr. Silcox, presented in his absence by Dr. E. H. Clapp, was entitled Research as a National Service, and that of Dean Ford The University in the Service of the State, and both dealt comprehensively with the opportunities and responsibilities of research in these directions. Dr. Newton, discussing Research, the Road to Knowledge, pleaded especially for coordination of effort, stating that "we have reached a point where more thought should be given to the problems of synthesis," and that "we cannot escape our responsibility, not only as scientists but as citizens, of thinking more about the implications of our work in relation to society as a whole."

Thus the station presented a well-rounded and worth while program. Doubtless it was of much benefit locally as an opportunity to acquaint the public anew with the station's achievements in its behalf, but it was also of national significance as an indication of what this type of institution has done in the past and can be expected to do in the future. From both points of view, it was happily conceived and capably executed.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A manual of biochemistry, J. F. McClendon (*New York: John Wiley & Sons; London: Chapman & Hall, 1934 pp. VII+381, figs. 58*).—This textbook "is a condensation and rewriting of mimeographed material, with considerable additions." Of the scope of the work it is noted, in part, that "it includes far more data on the biochemistry of inorganic substances and certain organic groups than are found in textbooks of physiological chemistry. The attempt was made to arrange substances in their chemical order (with the physiological order in the summary), but it was found very difficult to separate sodium from chlorine, for instance, since they exist chiefly as sodium chloride, and calcium from phosphorus since they exist chiefly in the body as minerals of the apatite series, or to separate enzyme or hormone from 'substrate.'

"Owing to the huge number of substances that occur in our food and therefore may either be absorbed or attacked by enzymes, and the fact that textbooks of biochemistry have never classified many of these substances, a section on fermentative products and essential oils (including related substances of animal origin) embraces quite a number of these substances. This section is intended to illustrate the process of fermentation and the synthetic powers of plants as well as to include many essential physiological substances, such as vitamin D, vitamin A, theelin, and theelol, which usually are not grouped according to their chemical nature."

Part 1 includes the introduction, in which are considered molecular size, colloids, and crystalloids, catalysis, calorimetry, internal secretions and metabolism, and ionic equilibria. Part 2, inorganic, treats the subjects of water, alkali, and alkaline earth elements, group 3, halogens, groups 6, 5, and 4, and heavy metals. Part 3, organic, takes up fermentation products and essential oils, lipides, glucides, protides, and nitrogenous bases; part 4, physiological summary, discusses foods, digestion, metabolism, and excretion; part 5, laboratory work on colorimetric and titrimetric microchemical analysis, deals with colorimetric-iodimetry, pH, and general directions, inorganic, and organic; and part 6, table of biochemical properties, presents the "physical and physiological properties of 1,000 substances of biochemical interest."

Introduction to physiological chemistry, M. Bodansky (*New York: John Wiley & Sons; London: Chapman & Hall, 1934, 3. ed., rewritten, pp. XI+662, figs. 39*).—The author's intention, as expressed in the preface of the first edition, has been to make this book "brief enough for use as an introductory volume and yet to give it sufficient scope to cover the field comprehensively. Laboratory methods and the description of tests have been omitted intentionally, since they are to be found in laboratory manuals devoted to the subject. The main aspects of physiological chemistry have been developed in relation to recent advances in the science. It is hoped that in this way the student will be afforded not only a knowledge of fundamental principles but also a realization of the developmental state of the subject."

In the present edition this intention has been maintained, but it has been "necessary to rewrite many sections of the book and to revise extensively much of the remainder. Such enlargement as the book has undergone in the process has resulted either from the necessity of including adequate accounts of some of the newer developments in physiological chemistry, or from the deliberate extension of the scope of the book in certain particulars. Thus the discussions of the chemistry of enzymes, the regulation of gastric acidity, muscle metabolism, the mineral requirements in nutrition, the vitamins, hormones, and many other topics have each required a small amount of additional space", and certain other topics have been given somewhat more detailed treatment.

[Chemical investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 70, 71*).—The biochemical work of the station has included a further study of the chemistry of the tobacco plant (E. S. R., 70, p. 439), with reference especially to the amide nitrogen; and work on protein chemistry, in which attention was directed toward the isolation of the rare amide glutamine.

[Chemical researches of the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 58, 59*).—These have included work on the determination of starch in plants, the determination of reducing sugars in plant extracts, a sucrose hydrolyzing enzyme of tomato leaves, and a method for describing the color of soybean oils.

The preparation of sodium tungstate free from molybdate, together with a simplified process for the preparation of a correct uric acid reagent (and some comments), O. FOLIN (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 311–314*).—Finding that the removal of molybdenum compounds from sodium tungstate by converting them into insoluble sulfides cannot be depended upon, the author describes a method whereby the molybdates are converted into highly colored sulfomolybdates, very soluble both in water and in alcohol. A sodium tungstate preparation free even from spectrographic traces of molybdenum was thus obtained:

"Dissolve 1 k of sodium tungstate in 2 l of water and add hydrochloric acid (dilution 1:1), slowly and with stirring, until the solution is neutral to litmus paper. An acid reaction is undesirable. Transfer the solution to a large flask or bottle. Pass H_2S into the solution in a moderately rapid stream for 15 to 20 min. Stopper the container and let stand overnight. Transfer to large beakers and add, very slowly at first and with constant stirring, about two-thirds volume of alcohol. The paratungstate is precipitated, and the colored sulfomolybdates remain in solution. Let stand until the next day; decant and filter, with suction, on a large Buchner funnel; wash with 50 percent alcohol until the filtrate is colorless. Transfer the precipitate to a 4-l beaker, add 1.5 l of water and about 2 cc of bromine, and stir for a few minutes. Then heat over a burner and continue the stirring until all the surplus bromine has been removed. (The bromine treatment is for the purpose of oxidizing such traces of sulfotungstates as are likely to be present.) Continue the heating and add clear saturated sodium hydroxide solution until the solution gives a permanent and fairly strong reaction with phenolphthalein paper. Cool. If the solution is turbid, filter. Then precipitate as before, with alcohol, and dry.

"The sodium tungstate thus obtained gives a moderate, permanently alkaline, reaction with phenolphthalein; its solutions are clear, and it does not give the slightest trace of pink color in the potassium xanthate test for molybdate described by Folin and Trimble [E. S. R., 52, p. 614]."

The uric acid reagent is to be prepared by the following simplified method:

Place 100 g of sodium tungstate (free from molybdate) in a 500-cc Florence flask. Mix from 32 to 33 cc of 85 percent phosphoric acid with 150 cc of

water. Pour the resulting solution onto the tungstate and mix. Add a few pebbles and boil very gently over a microburner for 1 hr. Loss of liquid during the boiling is prevented by a condenser. After the boiling, decolorize with a little bromine water, boil off the excess bromine, cool, and dilute to 500 cc.

"If the reagent so obtained is not perfect (in other words if it gives a blank with Merck's urea-cyanide or with urea-cyanide plus tyrosine), add 3 to 5 g of sodium tungstate (but no more) and boil for another 10 to 15 min., then cool, and decolorize as before. The addition of a little extra tungstate and the short second boiling can also be made without first testing the reagent for a blank."

On the problem of permeability and the factors by which it is affected.—The influence of surface active and hydrotropic substances on the permeability of membranes by acids and by sucrose [trans. title], A. N. Rao (*Biochem. Ztschr.*, *262* (*1933*), *No. 4–6*, *pp. 332–350*).—The penetrability of collodion, parchment, and rubber membranes, as well as that of collagen and of other membranes of animal origin, by solutions of oxalic, tartaric, and lactic acids and of sucrose is influenced by saponin, and by such hydrotropic substances as sodium benzenesulfonate and sodium salicylate was determined by titrating the quantity of acids under consideration which pass through a membrane covering the end of a tube 40 mm in diameter dipping into distilled water under definitely controlled conditions during a fixed interval, with and without the addition of various quantities of the substances, the effect of which on the rate of dialysis was to be measured.

Except in the case of the sugar solution and rubber membrane, saponin effected a marked increase in the permeability of the membranes, the effect of small concentrations being greater than that of high concentrations. The maximum increase in the permeability of the parchment-paper membrane was nearly 42 percent for 0.1 N oxalic acid to which 0.2 percent of saponin had been added. The rate of dialysis of sucrose (polarimetrically determined) was increased 34.5 percent by 0.10 percent of saponin, but only 3 percent by 0.15 percent of saponin. Small quantities of ethyl, propyl, butyl, amyl, hexyl, and octyl alcohols showed similar effects, giving maximum increases at a low concentration, lesser increases or a decrease at higher concentrations.

Such hydrotropic salts as sodium benzenesulfonate and sodium salicylate also produced marked increases in the permeability of collagen and other animal membranes and showed an optimum concentration above and below which the effect was distinctly less. The maximum effect of sodium benzenesulfonate on the collagen membrane was an increase of about 48.8 percent in the rate of permeation of 0.1 N oxalic acid in the presence of a 0.050 N concentration of the salt. Sodium salicylate increased the permeability by about 70.4 percent when the concentration of this salt was 0.00625 N, and by about 72.5 percent when the concentration of the added salt was raised to 0.0125 N, but the increase dropped to 39.8 percent when the concentration of the salicylate was further increased to 0.0250 N.

Studies on acid formation by filamentous fungi [trans. title], R. Falck, W. Schoeller, and S. Michael (*Biochem. Ztschr.*, *262* (*1933*), *No. 4–6*, *pp. 280–293*).—The nature of the products of the decomposition of carbohydrates by *Aspergillus niger* was found to be influenced by the degree of molecular complexity of the compound acted upon. Mono- and disaccharide yielded gluconic, citric, and oxalic acids, whereas such polymers as starch yielded only citric and gluconic acids. In the presence of both polymers and carbohydrates of low molecular weight, the growth of the mold produced gluconic acid from the

compounds of low molecular weight, citric and oxalic acids from the more complex.

Studies on hydroxy amino acids [trans. title], E. ABDERHALDEN and F. BROICH (*Biochem. Ztschr.*, *262* (*1933*), *No. 4–6*, *pp. 321–328*).—Benzoylating serine in weakly alkaline solution resulted in the formation of the dibenzoyl compound. The same result was obtained in the cases of isoserine and polypeptides of serine. The O-benzoyl group was easily removed by alkali treatment.

Serine was found readily decomposable either by acids or by alkalies. By boiling the amino acids with 25 percent sulfuric acid, lactic, pyrotartaric, and carbonic acids, glycine, and ammonia were formed. A marked loss of serine in the distillation of its ester was also observed. It is concluded, from these and similar observations, that the serine isolated from the hydrolysis products of proteins amounts to about only one-third of the actual content.

On the hydrolysis of amino acids by aqueous extracts of bone black [trans. title], E. BAUR and K. WUNDERLY (*Biochem. Ztschr.*, *262* (*1933*), *No. 4–6*, *pp. 300–307*, *fig. 1*).—Bone black was found capable of bringing about the deamination of a number of amino acids. The supposition that the reaction was one of heterogeneous catalysis, the locus of the reaction being that of the charcoal surface upon which the substances acted upon were adsorbed, was tested by attempts to poison the catalyst. No poisoning of the catalytic surface took place, but, on the contrary, the water extract of the bone black brought about the same reaction, placing it in the class of homogeneous catalyses.

The amino acids shown to be acted upon in this way were glycine, alanine, lysine, phenylalanine, and aspartic acid. The effect of the aqueous extract was less than that of the charcoal itself, except in the case of phenylalanine, which was affected equally by the charcoal and its aqueous extract. The salts identified in the extracts were found to have hydrolytic power to some degree, either singly or in combination, but their effect was decidedly less than that of the extract.

The reaction of iodoacetic acid on mercaptans and amines, L. MICHAELIS and M. P. SCHUBERT (*Jour. Biol. Chem.*, *106* (*1934*), *No. 1*, *pp. 331–341*, *fig. 1*).—It is reported in a contribution from The Rockefeller Institute for Medical Research that iodoacetic acid reacts not only with sulfhydryl compounds, as also shown by Dickens (E. S. R., 72, p. 153), but also with amino compounds both aliphatic and aromatic, particularly with amino acids. All H atoms of the —SH or —NH_2 group are easily substituted by the radical —CH_2COOH. Examples of both these groups of reactions are described. The following compounds were prepared: Tri(carboxymethyl)amine, di(carboxymethyl) (α-carboxyethyl)amine potassium salt, carboxymethyldi(α-carboxyethyl)amine potassium salt, tri(α-carboxyethyl)amine potassium salt, tetracarboxymethylcystine, dicarboxymethylcysteic acid, dicarboxymethylcysteine acetate, tetracarboxymethyl-*p*-phenylenediamine, S-carboxymethylcysteine, S-carboxymethylglutathione, and S-carboxymethylthioglycolic acid anilide.

The synthesis of pentocystine and homomethionine, V. DU VIGNEAUD, H. M. DYER, C. B. JONES, and W. I. PATTERSON (*Jour. Biol. Chem.*, *106* (*1934*), *No. 1*, *pp. 401–407*).—The synthesis of the disulfide of the 5-carbon homologue of cysteine, bis-δ-amino-δ-carboxybutyl disulfide (pentocystine), and of the next higher homologue of methionine, δ-methylthiol-α-aminovaleric acid (homomethionine), is described in working detail. Diformylpentocystine, S-benzylpentocysteine, and formylhomomethionine were also prepared.

On the effect of monoiodoacetic acid on the bacterial and enzymatic hydrolysis of glycosides [trans. title], K. MEYER (*Biochem. Ztschr.*, *262* (*1933*), *No. 4–6*, *pp. 329–331*).—Monoiodoacetic acid was found to have as strong a spe-

cific inhibitive action upon the β-glucoside hydrolysis effected by lactic acid streptococci as upon the formation of lactic acid from glucose. The influence of the same inhibiting agent upon the β-glucoside hydrolysis effected by emulsin was about only 0.002 as great. The author infers that the β-glucosidase of the lactic acid streptococci is different from that of emulsin and reacts in a different manner upon the substrate.

A convenient synthesis of dl-lysine, J. C. Eck and C. S. Marvel (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 387–391*).—The details for the synthesis of *dl*-lysine dihydrochloride from cyclohexanone are described in a contribution from the University of Illinois. The over-all yield in this process was between 22 and 23 percent of the theoretical amount, that is, 1,000 g of cyclohexanone yielded about 500 g of *dl*-lysine dihydrochloride.

Cyclohexanone was converted to the oxime. The oxime was rearranged to 2-ketohexamethyleneimine, and, without isolation, this lactone was hydrolyzed and benzoylated to give ϵ-benzoylaminocaproic acid. The conversion of ϵ-benzoylaminocaproic acid to *dl*-lysine dihydrochloride was accomplished by brominating in the alpha position, replacing the bromine with an NH_2 group by dissolving the bromoacid in concentrated aqueous ammonia and allowing 2 days for the completion of the reaction, and, finally, hydrolyzing the benzoyl lysine with hydrochloric acid.

The formation of sugars from formaldehyde in the presence of alcohols [trans. title], G. Gorr and J. Wagner (*Biochem. Ztschr., 262 (1933), No. 4–6, pp. 351–354*).—The polymerization of formaldehyde to form sugars, which does not give good yields in aqueous formaldehyde solutions stronger than 4 percent because the polymerization reaction is replaced in part by that of the formation of methyl alcohol and formic acid, was found to take place rapidly, with good yields and at much higher concentrations, in the presence of certain alcohols. As an example of the experimental results recorded, 50 cc of a 30-percent aqueous solution of formaldehyde, mixed with 50 cc of each of the following series of alcohols, with the further addition of 1.5 g of calcium oxide and heated under the reflex condenser, gave an apparently complete reaction in the times respectively indicated for each alcohol: Glycerol, 1 min.; ethylene glycol, 2 min.; methyl alcohol, 20 min.; ethyl alcohol, 30 min. A sugar solution capable of reducing Fehling's solution in the cold was produced. Trioxymethylene (25 g) heated in glycerol (25 g) in the presence of lead oxide (1 g) showed a strongly exothermic reaction which had to be controlled by cooling. The reducing power of the resulting solution corresponded to that of a 30-percent glucose solution.

Peptic hydrolysis of insulin, A. M. Fisher and D. A. Scott (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 289–303*).—The authors describe a method for the determination of the nitrogen distribution in small quantities of insulin. This method was applied to the products of peptic digestion of crystalline insulin, the physiological activity of samples of the digest having been correlated with the nitrogen distribution. It was found that a loss in physiological activity was accompanied by a decrease in the tyrosine content. No significant variation in the quantity of cystine could be detected, but an increase in lysine was observed. A comparatively slight destruction of the physiological activity of crystalline insulin by peptic hydrolysis yielded a product from which the rhombohedral crystals characteristic of insulin could not be obtained.

Effect of dyes on yeast fermentation as influenced by hydrogen-ion concentration, E. Adams and W. J. Robbins (*Jour. Agr. Res.* [*U. S.*], *49 (1934), No. 11, pp. 1025–1031, figs. 6*).—The authors of this contribution from the Missouri Experiment Station found that the fermentation induced by *Saccharo-*

myces cerevisiae in a 4 percent solution of glucose in phosphate buffer solutions in which the dye to be studied was also dissolved caused buffer mixtures having pH values higher than about 5.0 to become more acid, and those of lower pH value to become less acid.

"To avoid this difficulty the following procedure was used: The yeast was exposed in 150 cc Erlenmeyer flasks for 24 hr. at room temperature to the dye at various H-ion concentrations in the sodium phosphate buffer mixtures, which contained no sugar. At the end of 24 hr. the dye and buffer mixtures were decanted and replaced by a nutrient solution composed of KH_2PO_4, 0.1 g; NH_4NO_3, 0.1 g; autolyzed yeast, 5 cc of 1 percent extract; glucose, 60 g; redistilled water, 1,000 cc. The yeast and nutrient solution were transferred to fermentation tubes and incubated at 32° C. In this case the yeast was exposed to the dye at various H-ion concentrations, and since no fermentation took place during this exposure little change in reaction occurred. Fermentation by the treated yeast occurred at the same pH value, that of the nutrient solution, the pH of which was 5.9." The dye concentrations used were 1:100 and 1:1,000 in the experiments with rose bengale; from 1:5,000 to 1:50,000 in the cases of the other stains named. The effect of the pH value of the dye solution from about pH 3.0 to about pH 8.0 was investigated.

"The toxicity of rose bengale and of eosin was greater in the more acid solutions, the effect becoming noticeable in solutions more acid than pH 6.0 and pH 5.0, respectively; the toxicity of safranine was greater in the less acid solutions, the injurious effect becoming noticeable at reactions more akaline than pH 6.0. The toxicity of dahlia was least in the most acid solutions used. However, the influence of H-ion concentration on the toxicity of this dye was not marked. The toxicity of brilliant green under the conditions of the experiments increased with decrease in H-ion concentration up to about pH 5.5, where precipitation of the dye occurred. In general, increasing H-ion concentration increased the toxicity of the acid dyes, and decreasing H-ion concentration increased that of the basic dyes."

The antitrypsin of egg white, A. K. Balls and T. L. Swenson (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 409–419, fig. 1*).—"The antitryptic power of a preparation may be estimated, though only very roughly, by a method which determines the quantity of inhibitor needed to depress the activity of a standard trypsin to half its normal amount. The inhibitor was added to a fixed amount of practically inactive trypsin, and followed after 5 min. by the amount of enterokinase which the enzyme should normally receive for complete activation." The relation between inhibition and amount of inhibitor followed a smooth curve, "so that if several points are determined with different quantities of inhibitor, the quantity giving 50 percent inhibition may be found by drawing the curve. Better methods are doubtless available, but this served to guide us to a procedure for concentrating the inhibitory substance."

Such a method of concentration is described, as are also the properties of the concentrated inhibitor and the effect upon it of hydrogen peroxide, which destroyed its inhibitory effect; of 0.005 N iodine, which did not diminish the effect in 30 min.; of saturated hydrogen sulfide solution for 18 hr., which also brought about no change; of N sulfuric acid solution, which had little effect in 18 hr.; and of N sodium hydroxide, which destroyed the capacity to interfere with the action of trypsin. When 10 mg of the inhibitive substance were dissolved in 1 cc of water containing 1 mg of sodium fluoride, the inhibitive activity was reduced slightly.

Of the nature of the action of the inhibitive substance it is noted that "the inhibitor does not combine with the active enzyme, thus preventing the

access of a digestible substrate. This would constitute competitive inhibition, in which increasing amounts of inhibitor produce increasingly large effects. It follows . . . [from the results shown] that the reverse is true in this case. The inhibitor combines, therefore, either with the enterokinase or with the inactive enzyme."

Further studies on the concentration and chemical nature of vitamin G, L. E. BOOHER (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 591–597*).—The author's method of concentrationg vitamin G from whey powder low in lactose by means of successive extraction processes[1] has been extended by further adsorption of the fiftyfold concentrate on Lloyd's reagent, followed by extraction with dilute pyridine solution and elimination of the material insoluble in water or dilute acetic acid. The resulting product represents a two-hundredfold to three-hundredfold concentration and furnishes between 3,000 and 3,500 Sherman-Bourquin units per gram.

"Additional study confirms the opinion previously expressed by the author that vitamin G is itself the water-soluble yellow, green-fluorescent pigment of whey, or that the pigment is an integral part of the vitamin. The methods of preparation of the vitamin concentrate, its elementary composition, the characteristics of its absorption of light within the limits of 2,000 a. u. and 5,000 a. u. of wave-length, its general in vitro properties, its nutritional function, and potency are presented. Consistent agreement of separately prepared products with respect to each of these attributes indicates that the method of concentration yields a relatively homogeneous product."

Determination of vitamin C in animal tissues by a modification of the silver method [trans. title], E. HARDE (*Compt. Rend. Soc. Biol. [Paris], 116 (1934), No. 17, pp. 153–155*).—Preliminary extraction of animal tissues with methyl alcohol for from 15 to 30 min. has been found to render the silver nitrate test for ascorbic acid more sensitive.

A simple method for detecting "non-acid" milk, G. A. COX (*New Zeal. Jour. Agr., 49 (1934) No. 4, pp. 231–234*).—In this paper from the Dairy Research Institute, the author describes a simple test for detecting nonacid milk. Briefly the method consists of (1) placing 20 cc of various milks in test tubes, (2) pasteurizing the tubes in water at 145° F. for from 10 to 15 min., (3) cooling in cold water, (4) adding 3 drops of starter to 1 cc of methylene blue solution to each tube, and (5) incubating the tubes at 98° and noting the time taken for the blue color to disappear.

Detection of lactic acid in milk and cream, H. C. TROY and P. F. SHARP (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 759–762*).—In this article from the [New York] Cornell Experiment Station the authors describe a test for detecting lactic acid in milk and such milk products as cream, dried milk, condensed milk, evaporated milk, and vanilla ice cream. In brief, the test consists of saturation with ammonium sulfate, filtering, shaking the filtrate with ethyl ether, separation of the ether layer, neutralization of the acid with alkali, evaporation of the ether, washing the ethyl ether residue with petroleum ether, taking up the residue with water, heating with sulfuric acid, cooling, and adding guiacol. A red color indicated lactic acid. With care, this procedure was accurate to about 0.002 percent of lactic acid in milk.

The utilization of agricultural byproducts in the production of propionic acid by fermentation, H. G. WOOD and C. H. WERKMAN (*Jour. Agr. Res. [U. S.], 49 (1934), No. 11, pp. 1017–1024*).—In the experiments reported upon in this contribution from the Iowa Experiment Station, the utilization of hydrol

[1] Jour. Biol. Chem., 102 (1933), No. 1, pp. 39–46.

whey, milk blackstrap molasses, corn meal, artichoke tubers, and potatoes in the production of propionic acid by fermentation was investigated, and an evaluation of corn gluten meal and yeast as nitrogen sources was made. Investigations on the fermentation of glucose in which steep water was used as a source of nitrogen are summarized. The results led to the following conclusions:

"Hydrol, whey, milk, blackstrap molasses, artichoke tubers, potatoes, and corn meal contain carbohydrates which are utilized by *Propionibacterium arabinosum*. Hydrol and whey are the most satisfactory of the materials tested.

"Corn gluten meal and steep water serve as sources of nitrogen for the propionic acid bacteria."

List of publications on pulp and paper (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [2]+17*).—This is a classified bibliography of the Forest Products Laboratory's publications in this field.

AGRICULTURAL METEOROLOGY

Report of the Chief of the Weather Bureau, 1933–34 (*U. S. Dept. Agr., Weather Bur. Rpt., 1934, pp. III+157, pls. 4*).—This report, like previous reports (E. S. R., 71, p. 10), gives a brief administrative review of activities of the Weather Bureau during the year, a general summary of weather conditions of each month of 1933, brief summaries of data regarding tornadoes, hail, losses from windstorms, sunshine, and excessive rainfall during the year, and detailed tabulations of data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States.

"The year 1933 was considerably warmer than normal. The average temperature excess for all States was +1.8°, or twice that of 1932. Precipitation was below normal generally; the average for the entire area was 2.4 in. less than that of 1932. . . . Snowfall was generally subnormal, but there were some instances of unusually large amounts." "Practically all the northern, southern, western, and interior portions of the country were drier than normal."

Monthly Weather Review, [November–December 1934] (*U. S. Mo. Weather Rev., 62 (1934), Nos. 11, pp. 397–431, pls. 10, figs. 6; 12, pp. 433–478, pls. 18, figs. 18*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 11.—Turbidities of American Air Masses and Conclusions Regarding the Seasonal Variation in Atmosphere Dust Content, by H. Wexler (pp. 397–402); Some Wind Velocity Correlations, by E. R. Miller (pp. 402–404); Record November Fog Preceding Phenomenal Winter of 1933–34 in the Pacific Northwest, by A. B. Carpenter (pp. 404–407); Winter Fogs in the Great Valley of California, by R. C. Counts, Jr. (pp. 407–410); and Regression Equations Analyzing the Immediate Antecedents of Temperature Anomalies in Straits of Florida Surface Water, by G. Slocum (pp. 411–415).

No. 12.—The Significance of Air Movements across the Equator in Relation to Development and Early Movement of Tropical Cyclones, by L. T. Chapel (pp. 433–438); Monthly and Seasonal Distribution of Snowfall in California, by M. Sprague (pp. 438–441); Observations of Condensation-Nuclei in the Atmosphere, by H. Landsberg (pp. 442–445); Precipitation in the Northern Great Plains, by W. A. Mattice (pp. 445–447) (see p. —); Meteorological Extremes of the Southwest, by C. E. Koeppe (pp. 447–452) (see p. —); Relation between Visibility Restrictions and Auto Mishaps in Greensboro, N. C., by J. C. School

(pp. 453, 454); Weather and Pears in New York State, by W. A. Mattice (p. 454); *Preliminary Report on Tornadoes in the United States during 1934*, by R. J. Martin (p. 455); The Weather of 1934 in the United States, by R. J. Martin (pp. 455–457); and Tropical Storms of 1934, by G. E. Dunn (p. 457).

Climatological data for the United States by sections, [September–October 1934] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 21 (1934), Nos. 9, pp. [200], pls. 3, figs. 3; 10, pp. [200], pls. 3, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

A comparison of the weather records at the station farm and the Weather Bureau station in New Haven (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 65–68*).—Data for temperature and precipitation, 1932 to 1934, inclusive, at New Haven and at the Mount Carmel experimental farm about 7.5 miles away, show considerable differences in weather conditions at any one time in these two localities within a relatively short distance of each other and are stated to "demonstrate the need for many more weather stations in the State."

The mean monthly temperature at Mount Carmel is usually between 2° and 3° lower than that of New Haven, except for April and May when it is between 1° and 2° lower. During the winter months the extremes of low temperature show a greater difference. "During the hottest days of summer, when the temperature is above 90° F., the instruments at Mount Carmel usually register from 1° to 4° above New Haven."

The observations in New Haven were taken at an elevation of about 74 ft. above sea level in the center of the city, about 1 mile from Long Island Sound. The observations at Mount Carmel were taken at an elevation of 220 ft. above sea level in open country.

Meteorological extremes of the Southwest, C. E. KOEPPE (*U. S. Mo. Weather Rev., 62 (1934), No. 12, pp. 447–452*).—This article reviews in some detail extremes of temperature, precipitation, wind, and other meteorological phenomena in the Southwestern United States. It is stated that the most pronounced extremes of temperature appear to be in Colorado at elevations between 5,000 and 10,000 ft. Least absolute ranges of temperature are found in southern Texas and Louisiana. The Southwest, particularly the normally drier portions, has the most erratic rainfall of any part of the United States. The region as a whole has occasional hailstorms which do a "vast amount of damage in a short time not only to crops but also to property and buildings." Tornadoes are more frequent in Arkansas than in any other Southwestern State. Damage from winds and tornadoes is relatively infrequent in New Mexico and Arizona.

Precipitation in the northern Great Plains, W. A. MATTICE (*U. S. Mo. Weather Rev., 62 (1934), No. 12, pp. 445–447, pls. 4, fig. 1*).—This article gives and interprets precipitation charts which show that, for the northern Great Plains region, "for every series of years with subnormal rainfall there is a subsequent recovery with above-normal amounts for several years. The periods are far from uniform in length, . . . but the most striking thing is the alteration of depressions and recoveries."

SOILS—FERTILIZERS

[Soil investigations of the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 86–88, 89–91*).—Mention is made of the soil and land-cover inventory, soil testing, the peach soils of Connecticut, market garden fertilizer trials, acid or alkaline effects of fertilizers, nitrogen recovery from various fertilizers, conservation of fertilizer by cover crops, lysimeter data from

forest soils, moisture in forest soils, and effect of removing litter in pine plantations.

[Fertility studies by the Florida Station] (*Florida Sta. Rpt. 1934, pp. 47–50, 91–93, 94*).—The following soil studies are reported upon: The effect of varying sources and amounts of potash, nitrogen, and phosphoric acid on the composition and yield and quality of citrus fruits, and the fertilizer requirements of Satsuma oranges, both by R. W. Ruprecht; the composition of pecans as influenced by fertilization and soil types, by H. W. Winsor; the effect of green manures on the composition of the soil, by R. M. Barnette; bronzing or copper leaf of citrus, by C. E. Bell and Ruprecht; a study of "chlorosis" in corn plants and other field crop plants, by Barnette, J. P. Camp, and J. D. Warner; the occurrence and behavior of zinc in soils, by H. W. Jones; soil and fertilizer studies with celery, by E. R. Purvis and Ruprecht; soil fertility investigations under field and greenhouse conditions, by R. V. Allison, A. Daane, R. E. Robertson, and F. D. Stevens; and sulfur and manganese beneficial on alkaline Everglades soils, by Allison and Robertson.

[Soil investigations of the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 17, 18, 61, 62, 68, 69, 72, 73, figs. 3*).—Experimental work at the station and on the Moses Fell Annex, Herbert Davis Forestry, and Purdue-Vincennes Farms dealt with the lasting effect of soil liming, dust from limestone and gravel roads as affecting the fertility of adjoining fields, laboratory methods for determining fertilizer needs of soils for farm crops, availability of potash in the residues from the A. O. A. C. method for determining potash, and general fertility experiments at the three farms named.

[Soil investigations of the New Jersey Stations] (*New Jersey Stas. Rpt. 1934, pp. 85–88, 90–92*).—The general soil investigations have included fertilizer and lime studies, the distribution of TiO_2 in the soil, and research in soil colloid chemistry.

Research activities in microbiology are noted under the heads, decomposition of hemicelluloses and polyuronides, the preparation of artificial composts for mushroom production, the formation of lignoprotein complexes and their decomposition, bacteria concerned in the oxidation of thiosulfate, the bacterial population of the sea and their role in the cycle of life in the sea, the cycle of *Bacillus tuberculosis* in soil, and the production of lipolytic enzymes by fungi.

[Soil and fertilizer tests in Tennessee] (*Tennessee Sta. Rpt. 1933, pp. 9–13, 33–37*).—Fertilizer formulas are suggested for the State, together with data on dolomite as a fertilizer supplement, possible phosphate sources, liming, and a discussion by W. H. MacIntire of calcium and magnesium absorption by the soil, lime-potash fixation, limestone-phosphate and dolomite-phosphate studies, and the conservation of sulfates.

Soil Survey of Iowa.—Report 73, P. E. Brown et al. (*Iowa Sta. Soil Survey Rpt. 73 (1935), pp. 64, figs. 18, map 1*).—Crawford County, Iowa, occupies 457,600 acres of a loess soil area in the western part of the State, varying in topography from nearly level to steeply rolling along some of the stream slopes, but with 97.3 percent of the total acreage in farm land. Little artificial drainage is needed.

The soils listed include 73.7 percent of Marshall silt loam, the principal soil of the loess group, and 23 percent of Wabash silt loam, which forms practically the entire bottom-land group. In all, 8 types representing 7 series were found.

An appendix indicates the nature, purposes, methods, and present progress of the State soil survey of Iowa.

Classification and agricultural value of New York soils, F. B. Howe (*[New York] Cornell Sta. Bul. 619 (1935), pp. 83, figs. 13*).—This bulletin contains de-

scriptions of the area, of the climate, of the geology of the soil material, of the topography, and of the soil conditions; briefly discusses local conditions with respect to soil erosion by wind and water; assigns soil classifications and agricultural ratings to areas of Ontario loam, Bridgehampton silt loam, Palmyra gravelly loam, Genesee silt loam, Chenango gravelly loam, Hempstead loam, Dunkirk silty clay loam, Wooster gravelly silt loam, Sassafras silt loam, Langford silt loam, Mardin gravelly silt loam, Coloma fine sandy loam, Sassafras loam, Cattaraugus gravelly silt loam, Arkport fine sandy loam, Dutchess stony loam, Worth loam, Lackawanna stony silt loam, Vergennes clay, Cossayuna gravelly loam, Sassafras sandy loam, Gloucester loam, Merrimac fine sand, Plymouth sandy loam, Wethersfield fine sandy loam, Lockport loam, Culvers stony silt loam, Volusia silt loam, Clyde loam, Worth stony fine sandy loam, Dekalb stony silt loam, and muck; discusses the use of land in New York; and presents a key to the soils of New York.

Land reclamation, E. W. Knight *(U. S. Dept. Agr., Tech. Bul. 464 (1935), pp. 10–16, figs. 4).—This section of this bulletin discusses the land reclamation* studies at the Newlands, Nev., Field Station, including adequate drainage, methods of applying water, and cultural methods.

Soil blowing and dust storms, C. E. Kellogg *(U. S. Dept. Agr., Misc. Pub. 221 (1935), pp. 11, figs. 6)*.—The author concludes that "during extremely dry years there always has been and always will be some soil blowing. With a selection of lands for various uses and the wider adoption of superior tillage methods, soil blowing can certainly be reduced, probably to a point such that it will not endanger the agriculture of the region." Windbreaks, or "shelter belts", consisting of close rows of trees planted in a line at right angles to the direction of the prevailing winds, are described as one of the means for lessening soil blowing, for which "there exists a considerable possibility of success", especially east of about the hundredth meridian.

A comparative study of the bacterial flora of wind-blown soil, IV, V, L. M. Snow *(Soil Sci., 39 (1935), No. 3, pp. 227–231; 233–236)*.—These two papers continue a serial contribution already noted (E. S. R., 58, p. 515.)

IV. *Shackleford Bank, North Carolina.*—Comparing it with the Massachusetts dune soil earlier studied (E. S. R., 58, p. 18), the author finds that "the southern soil was much more alkaline and contained larger amounts of soluble salts, but the water-soluble carbonate content was not very large. . . .

"A lower total number of organisms in the southern soil was composed almost wholly of bacteria, or yeasts, whereas the percentages of actinomycetes and fungi were much higher in the northern soil. . . . Morphologically and culturally the forms studied were rather similar, the greatest variation noted being the almost total absence of sporeformers in the southern soil, as against 19.67 percent in the northern soil. Casein digestion and nitrate reduction were more pronounced in the southern soil."

V. *Monterey Peninsula, California.*—The Pacific coast material, "a fine-grained acid soil containing very little soluble salts and almost no combustible material", more closely resembled the Massachusetts soil than the southern sand, the total count lying between those of the north and south Atlantic coast samples.

"Morphologically the cultures from the three soils vary rather widely, although the percentages of sporeformers in the Pacific and northern Atlantic areas agree fairly closely. The much greater fermentative activity of the Pacific soil is a marked difference between the soils compared, particularly in the case of the 25 percent lactose fermenters and the one culture that formed gas in glucose and sucrose. . . . There is in the Pacific sand noticeably less

digestive action but approximately the same amount of reduction as in the northern soil. The southern Atlantic sand differs rather widely on these two points from the other two soils."

Isolation of some bacteria which oxidize thiosulfate, R. L. STARKEY (*Soil Sci., 39 (1935), No. 3, pp. 197–219, pls. 2*).—In the investigation reported upon in this contribution from the New Jersey Experiment Stations 2 only out of 29 soils examined showed the presence of autotrophic bacteria oxidizing sulfur under acid conditions, and of these soils 1 had previously been inoculated with *Thiobacillus thiooxidans* and had received an application of sulfur. Organisms able to effect the oxidation of sulfur in somewhat alkaline media were more readily detected. Organisms which decomposed thiosulfate in mineral solution were found in 28 soils. The rapidity and extent of oxidation varied with the soil. Decomposition of thiosulfate by crude cultures took place in mineral media over the wide range of reaction pH 6.0 to pH 9.0.

Three cultures, physiologically distinct from one another, were obtained from the soils. Culture A, a facultative autotroph, "seems to be a new species and is designated by the name *T. novellus* n. sp. It oxidizes thiosulfate with acid formation and fails to oxidize elemental sulfur. It is a small, Gram-negative, nonmotile, nonsporulating rod 0.6μ by 1.2μ in size. It grows well on both organic media and mineral media containing thiosulfate. Culture B is closely related to . . . *T. trautweinii*, Bergey et al. In the oxidation of thiosulfate by these bacteria the pH of the media increases. They make little visible evidence of growth in mineral thiosulfate solutions and grow on a variety of organic media. These cultures are not autotrophic and do not belong to the genus *Thiobacillus*. Culture C is identical with or at least closely related to *T. thioparus*, Beij. During oxidation of thiosulfate, the medium becomes acid and elemental sulfur is precipitated. This is a strict autotrophic bacterium, a small, nonsporulating, Gram-negative, nonmotile rod 0.5μ by 0.7μ in size."

Some of the cultural and morphological characteristics of these organisms are presented and are compared with *T. thiooxidans*, Waks. and Joffe, also a Gram-negative rod 0.5μ by 0.8μ in size.

Nitrogen fixation studies with fungi and actinomyces, F. E. ALLISON, S. R. HOOVER, and H. J. MORRIS (*Jour. Agr. Res.* [*U. S.*], *49 (1934), No. 12, pp. 1115–1123*).—Experiments with 9 cultures of true fungi, including 8 strains of *Aspergillus* and 1 *Cladosporium*, in which an attempt was made to find experimental conditions enabling these organisms to utilize atmospheric nitrogen, are reported in a contribution from the Bureau of Chemistry and Soils, U. S. D. A. The results were negative in all cases. "Similar studies with 5 species of common soil actinomyces, grown in various media, also showed no nitrogen fixation under conditions where excellent growths occurred in the presence of combined nitrogen.

"A critical consideration of all of the evidence on the subject indicates strongly that nitrogen fixation is, at most, limited to a very few species of the free-living fungi, and the data for these are certainly not conclusive. The evidence that certain mycorrhizal fungi can use atmospheric nitrogen, at least when growing in the roots of the host, is much stronger."

Soil bacteria that conserve nitrogen, II, H. J. CONN (*Farm Res.* [*New York State Sta.*], *1 (1935), No. 3, p. 7, fig. 1*).—This article (E. S. R., 72, p. 591) briefly defines the "zymogenous" and "autochthonous" types of soil microflora, and points out the possibility that *Bacterium globiforme*, rod-shaped under some conditions of culture, but spherical when grown in soil, may be identical with the globular micro-organisms regarded as autochthonous by Winogradsky.

Some facts about legumes as soil improvers, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 93 (1935), pp. [1]+2*).—Misconceptions as to the value of legumes without inoculation are noted, with suggestions for their profitable use.

Soil-water movement as affected by confined air, W. L. Powers (*Jour. Agr. Res. [U. S.], 49 (1934), No. 12, pp. 1125–1133, figs. 2*).—In the experiments reported upon from the Oregon Experiment Station, "the rate of wetting sandy loam was about twice as fast in an open tube as in one closed at the base. There is a slowing up in the rate of wetting as the air becomes compacted toward the base of a closed tube. Sufficient suction to produce the equivalent of approximately 0.5 atmosphere caused the rate of advance of moisture down through the tube to be many times as fast as in tubes dependent upon gravity alone. The rate of percolation did not seem to be increased appreciably by suction after percolation began. It appears that the friction largely overcomes suction force even in a fairly short column of soil. Where silty clay loam is substituted, a similar relative rate of wetting is observed. The rate of percolation, especially in heavy-textured soils, decreases with time, perhaps as a result of displacement of the soil solution, swelling of colloids, and rearrangement of soil particles under pressure in soil-solution-displacement tubes. Air pressure definitely increased vertical movement of capillary soil moisture.

"Any value of suction in tile drains would seem to be limited to short intervals. Furrow irrigation would tend to confine soil air less than flooding and therefore may favor penetration of irrigation water. Dispersion at the soil surface retards infiltration of water."

A note on the relationship between the chemical composition of soil colloids and two of their properties, H. A. Wadsworth (*Soil Sci., 39 (1935), No. 3, pp. 171–176, fig. 1*).—This paper is a statistical review of recent literature dealing with the relation between the chemical nature of soil colloids and their physical properties, and is a communication from the Hawaii Experiment Station.

"From the evidence available, there seems to be no reason for belief that SiO_2, Al_2O_3, and Fe_2O_3 exist in soil colloids in any form other than the simple oxides or hydrated oxides. Moreover, insofar as such statistical studies may be accepted, it would appear that each of these materials, as well as any organic matter which may be in colloidal form, possesses definite water-holding characteristics at the moisture equivalent. When the chemical composition of a colloid is known, its moisture equivalent should be easily determined. The base-exchange capacity of colloids seems to be a function of their chemical composition as well. SiO_2, Fe_2O_3, and organic matter appear to absorb these cations, whereas alumina seems to repel cations and possibly absorbs anions."

The amphoteric nature of three coastal plain soils, I, II, J. B. Hester (*Soil Sci., 39 (1935), No. 3, pp. 237–245, pl. 1; 247–254*).—The two papers here noted report a study carried out at the Virginia Truck Experiment Station upon a Portsmouth loamy fine sand, a Bladen sandy loam, and a Norfolk very fine sand.

I. *In relation to plant growth.*—The lowest reaction satisfactory for the growth of several crops on each of these soils is stated. It was found that "the point at which growth was markedly retarded was directly correlated with the appearance of aluminum in the drainage water. The addition of organic matter, in the form of peat moss, to the Bladen and Norfolk soils suppressed aluminum solubility at low pH values and enabled crops to grow more satisfactorily than in the untreated soils."

II. *In relation to the leaching and absorption of soil constituents by plants.*—The three soils named above were found to show wide variations in cation exchange capacity, replaceable bases, pH value, and organic matter content, as well as different amphoteric points, "which reflect differences in the leaching and absorption of soil constituents." Data to show the advantage of using the analysis of the plants and the drainage water from pot cultures as an indication of the limiting element in plant growth and the available nutrients and "toxants" for specific crops in these soils are given.

Ionic exchange of peat soils, B. D. Wilson and E. V. Staker (*[New York] Cornell Sta. Mem. 172 (1935), pp. 13*).—The authors applied the methods both of base exchange in N neutral barium acetate solution and of electrodialysis in an investigation of 12 soils, representative of the intensively cultivated peat-soil areas of New York. These soils were found to contain large amounts of replaceable cations, and they varied widely in the amounts of replaceable hydrogen which they contained and in the ability to absorb cations.

"Pronounced differences existed in the percentage base saturation of the soils. This was found to be intimately related to soil reaction and to calcium content. An intimate relation was found also between the soil reaction and the amount of replaceable hydrogen, and between the soil reaction and the amount of replaceable cations. Two of the soils were electrodialyzed, and the diffusates were analyzed for the kinds and the amounts of ions which they contained. The soil of greater acidity contained the smaller amount of replaceable cations. Calcium was the predominant exchangeable cation in each of the soils. It was essentially a part of the soil organic matter. Relatively large amounts of magnesium were removed from the soils during the operation. The soils contained only small amounts of replaceable potassium or replaceable sodium. Considerable amounts of sulfur, and small amounts of phosphorus, were present in the anode diffusates. Sulfur was present in organic form. The presence of ions in the anode compartment which normally migrate to the cathode, the presence of silicon in large amounts in the cathode compartment, and the presence of organic matter in both the anode and the cathode diffusate suggest that ions may have been transferred to the respective poles in complex organic form."

Note on the relation between lime content and pH values of soils, S. Kühn (*Soil Sci., 39 (1935), No. 3, pp. 167–169, fig. 1*).—Using an indicator method, the author made pH determinations on aqueous and on N potassium chloride extracts of 394 soils ranging from podsols to alkaline soils and, with respect to organic matter, from a high content to none. The greatest differences between the pH values of the aqueous and the potassium chloride solution extracts were found in the extracts of the alkaline soils. But small differences appeared in the extracts of the unsaturated soils.

"Although no theoretical explanation can be given for the results, the regularity of the curve points to definite correlation between the aqueous pH and the pH as obtained in potassium chloride extracts. The data certainly refute the assumptions hitherto existing that small pH divergencies occur with the saturated soils and great pH divergencies with the unsaturated."

The effects of lime on the hydrogen-ion concentration and base exchange complex of Grundy silt loam, R. H. Walker and P. E. Brown (*Iowa Sta. Res. Bul. 178 (1935), pp. 169–200, figs. 4*).—Limestone of 20-, 40-, and 100-mesh grades was applied at the rates of 1, 2, 3, 4, 5, and 6 tons per acre to a soil of which the lime requirement had been determined as 3 tons per acre. In each of these cases the greatest change in soil reaction occurred during the first month after treatment, the extent of the change depending both upon the quantity applied and the fineness of the grinding. Both the immediate and the proportionate

change from year to year during a period of 5 yr. was greatest in the soils receiving the largest applications of lime. The differences between the effects of the 40-mesh and the 100-mesh materials were not significant at the end of the 5-yr. period, and the 40-mesh limestone was nearly as effective as the 100-mesh grade in the first season.

The exchangeable hydrogen content of the base-exchange complex decreased and the degree of saturation of the base-exchange complex increased with each additional ton of limstone. The largest quantity of limestone applied, which was double the lime requirement of the soil, did not completely saturate the exchange complex with bases, but applications equivalent to the lime requirement or above increased the degree of saturation to about 80 percent.

"The data indicate that it may not be desirable to apply sufficient limestone to Grundy silt loam to decrease the acidity to pH 7.0 nor to replace all of the exchangeable hydrogen and completely saturate the exchange complex with bases. The data also indicate that a large proportion of the limestone used should be ground sufficiently fine to pass a 40-mesh sieve, and that it is not necessary that the limestone be ground as fine as 100 mesh when used under field conditions."

The use of electrodialysis for estimating phosphate availability in calcareous soils, J. B. Goodwin (*Colorado Sta. Tech. Bul. 12 (1935), pp. 32, figs. 9*).—Water soluble phosphorus and K_2CO_3 soluble phosphorus agreed better with actual field response to phosphate fertilizers than did the phosphorus extracted by electrodialysis. These methods were found much more rapid and less liable to errors than the method of electrodialysis. The phosphorus extracted by electrodialysis was shown to be markedly affected by the stirring, the temperature, the pH change of the soil suspensions, and the salt and lime contents of the soils. The variability in electrodialyzable phosphorus due to these factors is reduced when the phosphorus extracted is based upon coulombs transferred. A modification of the center compartment in the Bradfield three-compartment electrodialysis cell (E. S. R., 58, p. 717) which facilitates stirring, temperature measurements, and pH determinations of the soil suspension during electrodialysis, used in a modified method of electrodialysis, permitted correction, to a large degree, for the variables which affect electrodialyzable phosphorus.

"An application of 125 lb. per acre of treble superphosphate increases the phosphorus content of the soil by about 13 p. p. m. of phosphorus. The difference necessary for significance by electrodialysis is 19.6 p. p. m. of phosphorus as determined from this investigation. These results indicate that the method of electrodialysis is not sufficiently sensitive to measure the increase in phosphorus due to an ordinary application of a phosphate fertilizer. The process of electrodialysis is the least reliable of the three methods studied for estimating 'plant available' phosphorus in Colorado soils under the conditions of this experiment."

Report on phosphate investigations during 1934 (*Montana Sta. Bul. 296 (1935), pp. 30, figs. 7*).—The bulletin consists of two parts, of which the first, tests with legumes and grain crops, was prepared by J. Green; the second, tests of phosphate with potatoes, by F. M. Harrington.

Not all Montana soils were found to need additional phosphate, as evidenced by the results both of the Winogradsky test and of the field trials here noted. Much of the alfalfa land responded, however, and soils used for a number of other crops gave improved yields and a higher quality crop when treated with phosphate alone. Phosphate was beneficial in all of the tests made on potato soils. In some instances, however, ammoniated phosphate gave results superior to those produced by phosphate alone.

"Preliminary tests with fertilizers are recommended for every farm. Fertilizer trials made by the farmer on his own farm are inexpensive and will indicate whether the fertilizer is needed."

AGRICULTURAL BOTANY

[Plant physiology studies in Florida], J. R. NELLER (*Florida Sta. Rpt. 1934, pp. 108–110*).—Brief digests are given of the results of studies on the effect on plant growth of green manure added to Everglades soils; plant composition in relation to the requirements of Everglades soils; silicon, magnesium, and iron composition of pasture grasses and of forage crops in Everglades soils; the chloride content of plants and of ground waters; and the relation of organic composition of crops to growth and maturity.

[Plant physiology studies in New Jersey] (*New Jersey Stas. Rpt. 1934, pp. 72–77*).—The results are given of studies on the following subjects: The effect of aeration on rates of cation and anion nitrogen absorption (using tomato), the growth of plants in sand cultures, and the iron metabolism of rhododendron and other plants in relation to pH, calcium, nitrogen, and organic acids.

Boron in soils and irrigation waters and its effect on plants, with particular reference to the San Joaquin Valley of California, F. M. EATON (*U. S. Dept. Agr., Tech. Bul. 448 (1935), pp. 132, pls. 4, figs. 32*).—The natural occurrence and distribution of boron, especially in the Pacific Southwest, and the characteristic effects of boron deficiency and particularly of boron excess on various kinds of plants are discussed.

Based on sand-culture experiments conducted at Riverside, Calif., a table is presented showing roughly the degree of tolerance to boron of 55 different types of crop or ornamental plants. All citrus fruits, fruits of the rose family, and other tree fruits, except the date and olive, were classed as sensitive. The cereals, potato, tomato, sweetpotato, cotton, and olive were among the semitolerant, while cabbage, beet, asparagus, lettuce, carrot, alfalfa, date, and gladiolus were placed in the tolerant list. The hotter and drier the season, the less boron many plants, including the stone fruits, were able to withstand.

The boron content of leaves from field plantings and from sand cultures supplied with boron at 5 p. p. m. is tabulated. Boron usually increased as the leaves grew older, and there was a stronger tendency for the boron-sensitive plants to accumulate more than those of either the semitolerant or tolerant group. Important exceptions prevent this tendency from being considered as the sole basis for tolerance. Boron accumulation in lemon leaves was greater than elsewhere in the plant and was greater in the dead or yellowed portions than in the green areas or in the main veins and petioles of boron-injured leaves. Boron did not, however, accumulate in the leaves of stone fruits to the extent that it did in many boron-sensitive plants and leaf symptoms were rare, but in prune and apricot trees boron accumulated to a greater extent in the bark and in prune was found even more concentrated in the buds than in the adjacent bark. In prune, abnormal overgrowth and gum formation was induced at the nodes. Plant growth was found to decrease and boron accumulation to increase as the proportion of boron in the nutrient solution was increased. The symptoms of boron injury are described.

A study of boron in the soil showed that an equilibrium exists between the undissolved boron in the soil and the boron in the soil solution. Soils were found to vary in their boron-fixing power. Much boron could be added, through irrigation water or otherwise, to soils with high boron-fixing power without producing plant injury for a time. When irrigated with boron-contaminated

water, some soils were found to remove boron and to yield a soil solution containing less boron than the irrigation water, but with continued accumulation, perhaps after several seasons, a toxic concentration in the soil solution might be reached, after which it was found that much boron-free water might have to be passed through the root zone to avoid boron injury.

The removal of boron from irrigation water was found to be impracticable. Field observations, however, indicated that the liberal use of nitrogenous fertilizers in citrus plantings reduced the severity of boron injury.

The water supplies, the geographic and geologic characteristics of the San Joaquin Valley, and the first observations of boron injury there (1922) are discussed. The conditions that determine the concentration of boron in irrigation water which will cause injury are considered to be the initial boron content of the soil, the prevailing transpiration rates, the tolerance of the crop, the physical character of the soil, the annual quantity of water used, and the amount of rainfall. With plants sensitive to boron, in the southern portion of the San Joaquin Valley, it is conservatively held that above 0.3 p. p. m. the less boron there is in an irrigation water the better. In Ventura County, however, up to 0.5 p. p. m. is not feared, because of the less active transpiration and higher rainfall prevailing. The relation to plant growth of other constituents besides boron in the irrigation water is discussed.

The major portion of the bulletin is devoted to the tabulated analyses of 450 water samples from streams and wells of 35 quadrangles in the San Joaquin Valley, with the sample descriptions and maps showing locations where they were taken, followed by brief descriptions of the general characteristics of the waters of different portions of the valley. Not only boron, but bicarbonate, chloride, sulfate, calcium, magnesium, and alkali bases were determined. The sodium percentage is given in each case, an important new inclusion in reports of water analyses. The methods of analysis are given. The question of the bacterial reduction of sulfates is discussed.

Few irrigation waters of the San Joaquin Valley were found to contain concentrations of boron or other salt constituents sufficiently high to be directly injurious to plants, but injury has resulted, according to the author, from the continued use of many of these waters because of the increase of these elements in the soil solution due to transpiration and evaporation. There was a marked tendency toward higher boron concentrations in the more highly mineralized waters.

Higher percentages of sodium were found in some San Joaquin Valley irrigation waters than of calcium and magnesium, thus tending to cause soils to become hard and relatively impervious to water. When sodium exceeds 60 percent of the sum of the calcium, magnesium, and alkali bases, hardening of the soil is held likely to result. Adequate leaching is considered necessary to prevent the concentration of the soil solution from reaching a point harmful to plant growth, even when relatively pure irrigation water is used.

GENETICS

A cytological study on 8-chromosome rye, N. Hasegawa (*Cytologia, 6 (1934), No. 1, pp. 68–77, figs. 15*).—The chromosome complement of rye (*Secale cereale*) plants, found to have 8 chromosomes in their pollen mother cells, comprised 7 chromosomes similar to those of 7-chromosome common rye and an additional small chromosome. Regular behavior was shown by 8 bivalents during meiosis, but the extra chromosome showed rather irregular behavior in primary nuclear division of pollen grain. In most cases two halves of it were included in the generative nucleus or remained lagging, so that the vege-

tative nucleus received 7 ordinary chromosomes. From the irregular distribution of the extra chromosome, plants having 14, 15, and 16 chromosomes in diploid might be expected in the offspring of 8-chromosome rye.

On the nature of chromosome association in N. tabacum haploids, W. E. Lammerts (*Cytologia, 6 (1934), No. 1, pp. 38–50, figs. 15*).—Studies of pachytene and metaphase behavior in the coral (E. S. R., 69, p. 191) and normal haploids of *Nicotiana tabacum* are reported from the University of California.

Bibliography on the breeding and genetics of the millets and sorghums (*Cambridge, Eng.: Imp. Bur. Plant Genet., 1932, pp. [2]+21*).—This annotated bibliography embraces 92 titles.

The tailless breed [of sheep] (*South Dakota Sta. Rpt. 1934, p. 22*).—Progress in the development of the tailless breed of sheep is noted.

Studies in heredity (*Indiana Sta. Rpt. 1934, p. 25*).—Hair whorls on the head were dominant to nonwhorls in guinea pigs.

On the genetics of subnormal development of the head (otocephaly) in the guinea pig, S. Wright (*Genetics, 19 (1934), No. 6, pp. 471–505, figs. 3*).—Continuing the studies of otocephaly in guinea pigs by Wright and Eaton (E. S. R., 50, p. 527), variations in its occurrence in different branches in inbred lines from 0 to about 27 percent are reported.

A study was made to determine the nature of the ultimate genetic and environmental factors, their relative importance, and the time and mode of their action. The results indicated that otocephaly is a function of the fertilized egg, and that the expression is influenced by unfavorable environmental conditions.

The strong hereditary tendency toward otocephaly observed in the different lines demonstrated that it is neither a matter of toxemia nor cytoplasmic transmission, nor a conditioning of the egg by its nucleus before maturation and fertilization. The sex incidence of 2 female to 1 male otocephalous individuals gives additional support to its Mendelian nature.

The results of crosses and the increased numbers of otocephalous offspring in the F_1 and F_2 generations were analyzed as suggesting that otocephaly is due to the combination of one dominant sex-linked and one recessive gene.

This distribution of otocephaly was random in different sized litters, except for a slight excess of small litters which are indicative of unfavorable conditions.

There was evidence that there are genetic differences in the types of defect, as expressed in the 12 grades of otocephaly set up. The genetic factors involved are suggested as bringing about a general depression in vital activity at a critical moment before cleavage of the egg and the medullary plate stage.

An analysis of variability in number of digits in an inbred strain of guinea pigs, S. Wright (*Genetics, 19 (1934), No. 6, pp. 506–536, figs. 4*).—An analysis is presented of the variability in the occurrence of extra digits within different branches of an inbred family of guinea pigs (family 35), in which 13.5 percent were polydactyls. The branching lines of this family varied in the production of 4-toed individuals from 0 to 69 percent. All of 21 substrains descended from a single brother-sister mating in the twelfth generation produced polydactyls, but occurrence varied from 9 to 69 percent.

Although there was some tendency toward similarity in the production of polydactyls between substrains and the strain from which they were derived, several significant changes were observed which are considered to indicate the occurrence of minor mutations and subsequent segregation.

Calculation of the numbers of polydactyls in litters of different sizes in the stock at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., and in the strains continued at the University of Chicago showed excesses

over the expected numbers of entire litters with all, or without any, 4-toed young in all litter sizes, indicating the importance of environmental factors in the variations in the occurrence of polydactyly within these strains which must be essentially homozygous.

The tetrachoric correlations between the occurrence of polydactyly among litter mates showed that 62 percent of the variability in the Beltsville data and 54 percent in the Chicago data were due to factors common to litter mates as compared with 27 percent between individuals from different litters but having the same parents.

The frequent asymetry of polydactyly was shown in correlations of about 0.75 between the left and right foot and 0.59 between single feet of litter mates. Hereditary influences were calculated as accounting for less than 20 percent variability in the occurrence of 4-toed individuals and on a single foot.

The important relationship between the age of the dam and polydactyly was noted (E. S. R., 58, p. 826). Dams 3 and 4 mo. of age produced 83 and 60 percent 4-toed young as compared with 17 percent produced by females over 15 mo. of age. Parity, weight of dam and sire, and sex did not seem to be important. However, heavier females of a given age produced more polydactyls.

The Beltsville data showed a considerably higher percentage of polydactyls born between November and April than between May and October in the different groups, but the condition was reversed in the Chicago stock. Some relationship to size of litter was suggested, but it was irregular.

The results of crosses between inbred strains of guinea pigs, differing in number of digits, S. Wright (*Genetics, 19 (1934), No. 6, pp. 537–551, figs. 2*).—In crosses of a stock of guinea pigs having 4 toes on the hind feet with inbred family 2 (3-toed) in the stock of the U. S. D. A. Bureau of Animal Industry and at the University of Chicago, the 146 F_1s were all normal. Among 233 F_2s there were 80.7 percent with 3 toes, 10.7 with 4 toes described as poor, and 8.6 percent with 4 toes described as good. Among 289 backcross individuals 44.6 percent were 3-toed and 22.8 and 32.5 percent, respectively, had poor and good fourth toes. These results suggest that polydactyly depends on one major recessive factor supplemented by modifiers for the degree of development of the little toe. However, in breeding tests of the 3-toed backcross progeny mated with recessives, only 22.6 percent 3-toed young were produced. Sixteen percent 3-toed young were also produced in matings of good and poor 4-toed individuals with pure 4-toed stock. Difficulty was experienced in obtaining pure breeding 4-toed young from these stocks. Further matings of backcross progeny with the pure 4-toed stock showed that segregation was occurring even after 5 top crosses and, by selection poor 4-toed progeny were produced from 3-toed dams. It is suggested that the 2 strains (D and 2) differ in at least 4 pairs of factors for polydactyly.

The results in the F_1, F_2, and BX generation from crossing the 4-toed stock with inbred family 32 were similar. In the F_1 generation of the cross of family 13 with the 4-toed line about one-third were polydactyly, a variability which must be attributed to nongenetic factors.

The results with the inheritance of polydactyly in family 35 crosses were noted in the above paper, and indicate something of the importance of nongenetic factors and the partial dominance of polydactyly in the F_1. Polydactyly seems to be primarily a matter of character threshold.

A calculation of the numbers of genetic factors responsible for polydactyly is included.

Studies on the expression of genetic hairlessness in the house mouse (Mus musculus): Skin folds, precocious hair regeneration, reactions to benzyl mercaptan, skin grafts, and parabiosis, L. T. DAVID (*Jour. Expt. Zool., 68 (1934), No. 3, pp. 501–518, figs. 2*).—Studies at the [Connecticut] Storrs Experiment Station showed that differences in the growth rate of the skin and body of mice result in the occurrence of skin folds in normal as well as hairless animals. The folds are masked by the hair cover in normal animals.

Regeneration of hair is hastened in the normal and recessive hairless mice by plucking, whereas clipping and shaving fail to hasten regeneration of hair. In the mouse heterozygous for dominant hairlessness the imperfectly keratinized hairs break off in plucking. Consequently, plucking does not cause precocious regeneration of the hair. Normal hair loss in the hairless deer mouse or clipping in the normal deer mouse results in precocious hair regeneration as contrasted with the results in the house mouse.

Skin grafting experiments and parabiotic union established between normal and hairless mice indicate that an endocrine abnormality is not concerned in dominant or recessive hairlessness.

The application of benzyl mercaptan does not influence the expression of the dominant hairless character, although recessive hairlessness is modified.

Inheritance of age at sexual maturity in the domestic fowl, D. C. WARREN (*Genetics, 19 (1934), No. 6, pp. 600–617*).—In studying the inheritance of age of sexual maturity in fowls at the Kansas Experiment Station, strains of Rhode Island Reds were developed from 1926 to 1931 with mean average age at first egg of 222.2±5.13 and 269.0±3.37 days, respectively. The results of reciprocal crosses between the early- and late-maturing strains suggested the operation of both autosomal and sex-linked factors. Where late-maturing males were used the age at first egg of the daughters was greater than in the opposite cross, but the age of maturity was not as great as in the matings in which both males and females were of the late-maturing stocks.

Progeny from the backcross of early-maturing males and F_1 females from either type of mating were practically as early maturing as the early-maturing strain. It appears that the early-maturing factor is effective in both heterozygous and homozygous conditions.

Considering E as the sex-linked factor and E' as the autosomal factor, the mean maturity ages of the various genotypes are suggested as EE' E', 222 days; ee' e', 269 days; EE' e', 217 days; and eE' e', 245 days. Data are presented on the age of maturity of males in the same crosses, but the measure of maturity was less tangible.

The operation of a sex-linked factor influencing age of maturity was further indicated in reciprocal matings between Rhode Island Reds and Single Comb White Leghorns. The mean age of maturity of the Leghorns was 172.4 days and of the Rhode Island Reds 247.6 days. The progeny of the cross White Leghorn males × Rhode Island Red females matured at 175.9±2.27 days, and the birds of the reciprocal mating matured at 206.4±3.78 days.

A second experiment involving this cross gave similar results except that the differences were smaller. Both tests thus indicate that the differences in age of sexual maturity between the Mediterranean and the larger birds are at least partly due to sex-linked factors.

In studying the order of the sex-linked genes on the chromosome, Barred Plymouth Rock females were mated with a Brown Leghorn male to produce males heterozygous for rate of feathering, barring, gold-silver, and age at sexual maturity. Among the 295 progeny produced by mating the F_1 males to Rhode Island Red hens, the average age of maturity of 121 barred pullets was

200.7±2.31 days as compared with 189.5±1.80 days for the 174 nonbarred pullets. There were no significant differences between the age at sexual maturity of the early- and late-feathering and the silver and gold groups.

In another experiment in which the F_1 males from the cross White Leghorn males × Rhode Island Red females were mated to Rhode Island Red females, no significant difference between the age at maturity was obtained in the nonbarred-nonwhite progeny, but a difference of 17 days in the age of maturity was noted between the late- and early-feathering lots and 28 days between the silver and gold lots. From the results in this cross, the following crossover percentages were calculated: Age at sexual maturity and gold-silver, 35.5; age at sexual maturity and rate of feathering, 40.8; and age at sexual maturity and barring, 52.7. The order of these genes is suggested from this and other linkage studies as rate of feathering, gold-silver, age at sexual maturity, and barring.

Crossing production and exhibition of Rhode Island Reds, F. A. Hays (*Massachusetts Sta. Bul. 316 (1935), pp. 15*).—The F_1, F_2, and backcross progeny from the cross of exhibition and production strains of Rhode Island Reds were compared as to the characteristics of fecundity and plumage (E. S. R., 68, p. 606).

The birds of the production lines excelled in most of the fecundity, persistency, and hatchability characteristics except egg weight, which was greater in the exhibition line.

The data on the means for the progeny of the various generations indicate "that hybridization increases body weight, especially in the F_1 generation; that early sexual maturity dominates late sexual maturity; that high intensity depends on dominant genes; that winter pause is little affected by crossing; that winter egg size is increased; that hatchability is improved only in the first generation; that broodiness may be increased by hybridization; that persistency is lowered by crossing; that laying-house mortality is reduced only in the first generation cross; that annual egg production is above intermediate between the two parent stocks in the first hybrid generation and tends to decrease in the F_2 generation, but that production can be raised to a high level by back-crossing F_1 and F_2 females on production-bred males."

An analysis of plumage color of the different groups suggests the dominance of light modifiers. Considerable association was exhibited between dark surface and dark under-colors, and there was some evidence that smut is associated with dark surface color (E. S. R., 57, p. 624). Smut was more common in males, and sex-linked dominant genes seemed to be concerned with the inheritance of smut.

Regression of anterior pituitary reactions II and III in the mouse ovary, W. P. Kennedy (*Jour. Expt. Biol., 11 (1934), No. 3, pp. 262–266*).—In studying the permanency of the reaction of mice to the anterior pituitary reaction, doses of prolan sufficient to cause blood points or corpora lutea in the ovaries within 100 hr. were administered to 45 infantile and 16 adult females. The infantile mice were autopsied at intervals from 7 to 78 days after treatment, and the effects of the treatment showed a considerable degree of persistence up to at least 60 days. The adult animals exhibited even greater variation. About 5 to 8 mouse units appeared to be the approximate minimum sterilization dose. Three small litters were born to treated animals, but litter size was small.

The effect of suckling on the duration of pregnancy in the rat (Wistar albino), A. M. Hain (*Jour. Expt. Biol., 11 (1934), No. 3, pp. 279–282*).—Data are presented on the influence of suckling in the rat on the prolongation of the gestation period in the subsequent litter resulting from mating at the post-partum ovulation. The studies were conducted at the Institute of Animal Genetics, University of Edinburgh.

The results showed that where 3 or 4 young were suckled the next gestation was not prolonged, but where large litters were suckled prolongation up to 14 days was noted. Otherwise, the prolongation was not correlated with the number of young suckled. The delayed implantation of the ovum was not found to affect the occurrence of microphthalmia, which was prevalent in the stock.

Quantitative studies with the Friedman test in excessive vomiting of pregnancy, F. J. Schoeneck (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 357, 358, fig. 1*).—Tests of the amount of pregnancy urine required for the Friedman test for pregnancy showed that under normal conditions in 27 of 39 cases 0.5 cc or more was required, whereas all of 16 cases in which excessive vomiting occurred required 0.1 cc or less.

FIELD CROPS

[Agronomic work in Connecticut] (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 85, 88, 89, 91–93*).—Brief progress reports are made on genetic studies and variety tests with corn; fertilizer tests with potatoes on old tobacco land and with sweetpotatoes; and experiments with tobacco (E. S. R., 72, p. 324) concerned with the need for phosphorus fertilizer on new land, fertilizer placement, need for starter, i. e., nitrogen as nitrate, in the fertilizer for Broadleaf tobacco, effects of different rates and carriers of nitrogen, tests of new strains of Havana Seed tobacco in cooperation with the U. S. Department of Agriculture, and the development of new strains of Cuban Shade tobacco.

[Field crops research in Florida] (*Florida Sta. Rpt. 1934, pp. 25–34, 97–99, 101–106, 117, 118, 119–121, 126–129, 130, figs. 6*).—Progress reports on agronomic research (E. S. R., 72, p. 316) at the station and substations, carried on by F. H. Hull, W. A. Carver, W. E. Stokes, G. E. Ritchey, J. P. Camp, W. A. Leukel, J. D. Warner, R. M. Barnette, B. A. Bourne, F. D. Stevens, A. Daane, R. R. Kincaid, R. M. Crown, H. S. Wolfe, and W. M. Fifield, dealt with breeding work with corn, sweet corn, peanuts, and sugarcane; trials of sugarcane-sorghum crosses; variety tests with corn, oats, grain sorghum, sorgo, sugarcane, potatoes, crotalaria for pasture and silage, cowpeas, soybeans, lima beans (for resistance to leaf hoppers), alfalfa, clover, and miscellaneous forage and pasture grasses and legumes, and winter cover crops; production tests with hemp, ramie, and jute; fertilizer tests with corn, cotton, potatoes, and Napier grass; response of corn to several of the less abundant elements, especially zinc; a study of the development and deterioration of roots in relation to the growth of pasture plants grown under different fertilizer and cutting treatments; the relation of manganese to potato yields on marl glade soils; cultural (including planting) tests with corn, potatoes, cowpeas, soybeans, and velvetbeans; flooding sugarcane stubble just after harvest to control borer (*Diatraea saccharalis*); the storage of sugarcane and Napier grass in stack silos and in semitrench and stack silos; seed storage investigations; methods of producing seed in the field, germination of seed after 2 yr. in storage of different types, and factors involved in seedling production, all with tobacco; and crop rotation studies with corn, cotton, crotalaria, and Austrian winter peas. Pasture studies included comparative grazing tests with grasses alone and in mixtures; effects of different fertilizer formulas on yields of pasture grasses; comparisons of native v. improved and burned v. unburned native pastures, and of methods of preparing land before seeding; composition of burned and unburned range pasture grasses; and pasture studies on peat and muck soils. Certain projects were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Indiana] (*Indiana Sta. Rpt. 1934, pp. 17, 19–21, 64, 69, fig. 1*).—Continued agronomic studies (E. S. R., 71, p. 181), reported on briefly, dealt with effects of legumes in the rotation on yields of corn and wheat; time of applying nitrogen carriers as a top-dressing for wheat; alfalfa v. red clover for hay in drought years; relative yields of red clover and soybeans as hay crops; breeding work with wheat and soybeans; improvement of wheat in southwestern Indiana by premiums for quality, seed cleaning, and plowing for control of wild garlic; effect of fertilizers on the yield, composition, and quality of wheat; and fertilizers and seed mixtures for pastures.

[Crops experiments on the Newlands, Nev., Field Station], E. W. KNIGHT (*U. S. Dept. Agr., Tech. Bul. 464 (1935), pp. 16–21, 22–24, fig. 1*).—Results of variety tests with wheat, barley, corn, and potatoes, and with grasses and clovers for pasture, cultural experiments with potatoes, and fertilizer tests with spring wheat are reviewed in continuation of earlier work (E. S. R., 62, p. 32), and cultural and irrigation practices involved in production of alfalfa, potatoes, and pasture are described briefly.

[Field crops research in New Jersey] (*New Jersey Stas. Rpt. 1934, pp. 12–18, 34, 60, 61–63*).—Progress results are reported briefly from agronomic work (E. S. R., 72, p. 35), including breeding work with corn and rye for productivity and with corn and alfalfa for physiological superiority, as in ability to use soil nutrients; variety tests with seed flax (E. S. R., 71, pp. 187, 316), soybeans for hay, red clover (E. S. R., 72, p. 319), and annual hay crops; tests of legumes for green manure for corn; effect of cyanamide on yield and protein content of timothy hay; twin rows of potatoes, fresh cut v. suberized seed, fertilizer placement, and potash and magnesium studies; and fertilizer experiments with pastures. Seed certification work (E. S. R., 72, p. 616), with approved varieties of field crops, and the status of field crop production in New Jersey and its improvement also are discussed.

[Agronomic experiments in New Mexico] (*New Mexico Sta. Rpt. 1934, pp. 14–26, 34, 35, 45, 46, 55, 56, figs. 2*).—Field crops research (E. S. R., 71, p. 181), reported on briefly from the station and from outlying fields near Clayton, Capulin, and Mosquero, included variety tests with winter- and spring-sown wheat, oats, and barley, corn, grain sorghum, sorgo, cotton, potatoes, sugar beets, alfalfa, soybeans, cowpeas, field beans, millet, and miscellaneous silage and hay crops; breeding work with cotton; cultural tests with cowpeas, soybeans, and mung beans; fertilizer trials with cotton, alfalfa, and potatoes; irrigation tests with potatoes; studies of the annual production of sugar beet seed, involving method, rate, and date of planting; application of various fertilizers and manure, and rate of irrigation; studies of the curly top disease of sugar beets; investigation of factors affecting growth and germination of chamiza (*Atriplex canescens*), winter fat (*Eurotia lanata*), and *Valota saccharata*; adaptability of grasses and Ladak alfalfa for range improvement; determination of the protein and moisture content of samples of New Mexico wheat grown on dry land and under irrigation; and control of Johnson grass by chemical sprays. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Agronomic experiments in South Dakota], A. N. HUME (*South Dakota Sta. Rpt. 1934, pp. 18, 19–21*).—Brief reports are made on the progress of field crops research (E. S. R., 70, p. 763), including a study of phosphatic fertilizers for wheat; a phosphorus fertilizer test with flax; crop rotations; and control of creeping Jennie and leafy spurge by cultivation, smother crops, and chemicals.

Small grain and flax varieties in South Dakota, K. H. W. KLAGES (*South Dakota Sta. Bul. 291 (1934), pp. 43, figs. 21*).—The importance and distribution

of the several small grains and flax in South Dakota are discussed in some detail and the results of variety tests in several localities, largely within recent years, are summarized. Varieties recommended for different sections of the State include Ceres, Marquis, and Reward hard red spring wheat; Mindum and Kubanka durum wheat; Minturki, Turkey, and Beloglina hard red winter wheat; Richland, Iogold, Albion, Gopher, Cole, Rainbow, Silvermine, and Swedish Select oats; Odessa, Velvet, Wisconsin Pedigree 38, Glabron, Trebi, Horn, White Smyrna, and Ace barley; Bison, Redwing, and Linota flax; and Swedish, Advance, Dakold, and local hardy strains of rye.

[Field crops experiments in Tennessee], H. P. Ogden, L. S. Mayer, S. H. Essary, L. R. Neel, and B. P. Hazlewood (*Tennessee Sta. Rpt. 1933, pp. 8, 9, 14–16, 18–26, 28, 49, 50, 51–54*).—Progress results are reported from investigations at the station and substations (E. S. R., 70, p. 172), including breeding work with cotton, corn, sweet corn, red clover, winter peas, and soybeans; variety tests with cotton, corn, rye, potatoes, sweetpotatoes, lespedeza, soybeans, and tobacco; cultural (including planting) experiments with cotton, corn, soybeans, potatoes, crimson clover, and *Lespedeza sericea;* fertilizer, cutting, fire hazard, and seed treatment tests with *L. sericea;* tests of crimson clover for pasture and soil improvement; sowing barley and rye on lespedeza sod; comparison of winter cover crops; fertilizer tests, lint studies, and varietal differences in relation to weather conditions, earliness, shedding, and other factors, all with cotton; crop rotations; and pasture experiments. Certain lines of studies were in cooperation with the U. S. Department of Agriculture.

Welsh Plant Breeding Station (*Aberystwyth: Univ. Col. Wales, 1933, pp. [5]+164, [pl. 1]*).—An account is given of the organization and work of the station from its foundation in April 1919 to July 1933, including breeding work with herbage plants, collection of material, study of self- and cross-fertility and vigor, plant breeding technic, breeding and production of oats, varietal work with wheat, seed production of herbage plants, pests and plant diseases, and the establishment, improvement, and management of pastures. A list of important contributions of the station is included.

Grassland seeds (*[Gt. Brit.] Imp. Econ. Com. Rpt., 27 (1934), pp. 75*).—This report of the Imperial Economic Committee deals with the importance of the grasslands of the British Empire, strains and varieties, plant breeding, local supply and price of pedigreed seed, and the trade in herbage seed between Empire countries. Information on seed testing and seed certification and on the staining of imported seeds is appended, with statistics on the commercial movement of grass and clover within the Empire.

Pasture development in Australia, J. Leith Gillespie (*[Melbourne]: Author [1934], 2. ed., pp. 67, figs. 36*).—Practical information is given on the establishment and management of pastures in Australia and on the preservation of fodder as brown hay and silage. Suitable grasses and other pasture plants are described, with determinative keys.

Success with kidney beans not all "luck", W. O. Gloyer (*Farm Res. [New York State Sta.], 1 (1935), No. 3, pp. 5, 9*).—Proper physical condition of the soil, adequate fertility and organic matter, and freedom from diseases, especially root rots, are considered factors essential to success with kidney beans.

The relationship between certain morphological characters and lodging in corn, D. M. Hall (*Minnesota Sta. Tech. Bul. 103 (1934), pp. 31, figs. 5*).—Research to determine if there were characters that could be used as indices of lodging in selfed lines of corn and in F_1 crosses between the selfed lines was concerned mainly with measurement of root characters theoretically enabling a plant to withstand attacks by wind and rain.

The selfed lines were shown to possess inherited difference in depth, width, and volume of root clump; in number, length, size, and angle of brace roots; in stalk and ear height; in weight of ears; in lodging angle; and in the pounds necessary to pull the plants from the ground. The F_1 material showed similar differences, except in the case of width of root clump. A striking similarity was shown in the reaction of the selfed lines and F_1 crosses in the different replicates. A notable exception was length of underground stem which varied in relation to the depth of planting. Since secondary roots arise from the underground stem, the depth of their formation depended upon depth of planting.

Little or no relationship existed between amount of lodging and ear height, length of underground stem, stalk cross section, amount of disease on the stalk, size of brace roots, number of suckers, and weight of the ears. Stalk height was related to lodging angle in selfed lines but not in F_1 crosses. Pounds to pull the plant from the soil usually was correlated significantly with lodging, and a similar relationship was found for disease and lodging. Internodal length, disease on roots, depth, width, and volume of root clump, and length and angle of brace roots were associated with lodging to a certain extent in the selfed lines, but the coefficients were mostly not significant in the F_1 crosses.

The selfed lines and F_1 crosses differed significantly when artificially lodged in the pounds needed to pull the plants over to an angle of 45° from the vertical. Between index of lodging for 17 selfed lines and the pounds required to pull the plants down there was significant negative relationship when plants were pulled down on July 15, but little relationship when pulled on August 1. A differential response of the selfed lines in pounds to pull down on different dates indicated a different rate of root growth. Measuring the volume of dug root clumps at three different dates showed significant cultural differences and showed different volumes on different dates. Both selfed lines and F_1 crosses showed a positive significant relationship between volume of root clump and plant height when the data were taken on July 15, but showed no relationship at later dates.

When F_1 crosses from strong, intermediate, and weak parent lines were classified on the basis of the index of lodging, on the average strong × strong crosses showed lower ears, longer brace roots with wider angle, deeper and wider root clumps, larger root volume, less disease, fewer suckers, and more pounds to pull the plant from the soil than the weak × weak crosses, although there was individual variability. No particular difference could be noted in plant height or in number and size of brace roots between the two types of crosses.

When the parent lines were ranked as to actual measurements for each character, rather than on the basis of the lodging index, it appeared that lodging was a complex of characters and that these characters were inherited separately. Distribution of F_1 crosses on this same basis and comparison with parent lines entering into each cross gave an idea of the dominance or the expression of hybrid vigor. Hybrid vigor was expressed rather generally throughout the character classifications. A type of partial dominance was evident for high v. low ears, tall v. short plants, many v. few brace roots, wide v. narrow angle of brace roots, and no v. several suckers, although in several cases a reverse dominance seemed to occur.

Characters desired in F_1 crosses, which theoretically would give a plant ability to resist lodging, evidently must be selected from a study of the individual parent culture, since certain lines have low lodging indices in spite of the fact that they stand high on the scale in certain characters which are associated with lodging.

Influence of corn smut and hail damage on the yield of certain first-generation hybrids between synthetic varieties, R. J. GARBER and M. M. HOOVER (*Jour. Amer. Soc. Agron., 27 (1935), No. 1, pp. 38–45*).—Data presented in this contribution from the West Virginia Experiment Station support those reported earlier (E. S. R., 66, p. 548) in showing that under the conditions described increased barrenness because of smut is the most important factor in reducing yield. Significant average differences in yield of forage or grain were not obtained between adjacent paired plants (smutted and smut-free) among the later-maturing F_1 crosses of synthetic varieties. Among the earlier-maturing F_1 crosses, of six comparisons with yield of grain where size of smut boil was disregarded, two significant average differences favoring the smut-free plant were obtained. When forage yield was used as the criterion, disregarding size of smut boil, significant average differences were not found. When comparisons were made only between paired plants, one carrying at least one large smut boil, two (one for grain yield and one for forage yield) out of four average differences in favor of smut-free plants were found significant. In contrast to the relatively small damage caused by smut in corn grown in 1932 and 1933, a marked decrease in yield during 1932 was caused by a hail storm on July 7. The decrease in average yield between paired plants attributable to hail injury was 57.6 percent among the earlier-maturing F_1 crosses and 62 percent among the later-maturing ones.

Differential response of corn varieties to fertility levels and to seasons, G. H. STRINGFIELD and R. M. SALTER (*Jour. Agr. Res. [U. S.], 49 (1934), No. 11, pp. 991–1000, figs. 5*).—When hybrid and open-pollinated varieties of corn were grown in five seasons across four levels of soil fertility established by additions of fertilizer and manure, in studies by the Ohio Experiment Station in cooperation with the U. S. Department of Agriculture, yields were higher and rate of plant development more rapid at the higher levels. In some seasons, plants under very heavy fertility treatments developed rapidly in the presilk stage and slowly in the postsilk stage as compared with plants under more moderate applications. The difference in rate of plant development between unfertilized and heavily fertilized levels was markedly and progressively greater as rainfall was less. Differential varietal response in yield among the different levels was clearly significant in two seasons but not in the experiment as a whole.

The differential yield response of varieties due to different seasons was, however, consistent and highly significant and greatly exceeded that due to fertility levels. It seemed probable that change in climatic factors will affect relative varietal performance considerably more than will a quantitative change in available nutrients. While the data corroborated previous reports that a variety may be relatively better at low than at high fertility levels, or vice versa, the differences found seemed to be largely associated with adaptation to different geographical regions.

Certain Iowa hybrid varieties were greatly superior in the drier seasons, but their superiority was progressively less as seasons were more favorable, whereas a Connecticut hybrid was definitely a good-season variety. A variety evidently may be productive under a wide range of soil and climatic conditions. Iowa varieties tolerated the stimulating effect of manurial treatment better than eastern varieties in the drought year of 1930.

Varieties with high potential yielding-capacity tended to respond more favorably to the higher fertility levels. Relatively strong plant response in yield to the higher levels was associated with relatively strong plant response in rate of development to the higher levels.

The development of cotton culture in the Mediterranean Sea region outside of Egypt, M. PETONKE (*Die Entwicklung der Baumwollkultur im Mittelmeergebiet ausserhalb Ägyptens. Inaug. Diss., Friedrich-Wilhelms-Univ., Berlin, 1934, pp. [5]+96+[1]*).—This review of the history and status of cotton production in the countries (except Egypt) bordering the Mediterranean Sea also includes a bibliography embracing nearly 200 references.

Storage of cotton pollen, G. J. HARRISON and H. J. FULTON (*Jour. Agr. Res. [U. S.], 49 (1934), No. 10, pp. 891–896, figs. 2*).—Cotton pollen of the Pima-Egyptian variety was stored successfully in August at Sacaton, Ariz., under refrigeration, for 2, 3, and 4 days, in buds collected in the afternoon preceding anthesis, in flowers collected in the morning when anthers were beginning to open (considered the most practical method), and as loose pollen collected in the afternoon when all anthers were fully open. Pollen stored in the laboratory at air temperature or in a desiccator at air temperature over calcium chloride failed to effect fertilization. With all three of the storage methods which proved successful, each additional day of storage resulted in a material reduction in the degree of fecundation effected.

Crested wheat grass for dryland pastures, M. S. MORRIS (*Colorado Sta. Press Bul. 84 (1935), pp. [6], figs. 4*).—The characteristics, adaptation, pasture value, and seed production of crested wheatgrass are described, with remarks on results of trials under varied conditions in Colorado. Suggestions for stands include shallow (1 in. or less), early spring planting (March 15–April 1 in northern Colorado) on a clean firm seed bed, preferably after a clean cultivated crop, using a mixture of crested wheatgrass 7 lb., smooth bromegrass 8 lb., and yellow sweetclover 2 lb. per acre. For seed, 5 lb. per acre can be planted in double-drilled rows from 30 to 36 in. apart which may need one or two cultivations.

Some factors influencing the standing power of oats, G. DONALD (*Scot. Jour. Agr., 18 (1935), No. 1, pp. 34–40*).—Consideration of variety, time and rate of seeding, size of seed, and fertilizer factors in experiments at Craibstone indicated that the oats crop most likely to stand well on land into which rich turf is plowed is an early-maturing, strong-strawed variety of big-grain oats, of which a comparatively light seeding of graded seed is sown early and given a moderate dressing of a complete fertilizer.

Natural crossing in the pigeonpea, C. P. WILSIE and M. TAKAHASHI (*Jour. Agr. Res. [U. S.], 49 (1934), No. 10, pp. 923–927*).—Experimental results obtained at the Hawaii Experiment Station showed that there is a high percentage of natural crossing between varieties of pigeonpeas (*Cajanus indicus*) when grown in adjacent rows. The percentages of heterozygotes, or natural hybrids, in the progenies of open-pollinated pure-breeding strains as determined by color of flower and pod, ranged from 13.98 to 15.86 in the three strains studied. Few natural hybrids (0.17 percent) were found on bagged plants. See also earlier notes by Krauss (E. S. R., 57, p. 729; 67, p. 239).

Problems of potato growing (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 16 [1934], pp. 48*).—This report of a conference held at Rothamsted on February 20, 1934, includes a foreword by E. J. Russell and papers on Potato Diseases, by G. H. Pethybridge (pp. 9–17); The Eelworm Problem, by R. T. Leiper and M. J. Triffitt (pp. 18–24); Utilisation of Excess Potatoes on the Farm, by H. E. Woodman (pp. 25–33); Recent Fertiliser Experiments on Potatoes, by E. M. Crowther (pp. 34–40); Some Fertiliser Experiments with Potatoes on Fenland Soils, by H. V. Garner (pp. 41–43); The Raising of Blight-Resistant Varieties and Virus-Free Stocks, by R. N. Salaman (pp. 44–47); and Potato Growing in Lincolnshire, by T. O. Mawby (pp. 47, 48).

Distance of planting Rural New Yorker No. 2 and Triumph potatoes as affecting yield, hollow heart, growth cracks, and second-growth tubers, W. C. EDMUNDSON (*U. S. Dept. Agr. Circ. 338 (1935), pp. 19, figs. 9*).—In field experiments under irrigation, 1928–31, at Greeley in cooperation with the Colorado Experiment Station and State Board of Agriculture, Rural New Yorker No. 2 potato seed spaced 8, 10, 12, and 14 in., respectively, in 36-in. rows, gave increased yields of tubers under 3 oz., and of tubers weighing from 3 to 12 oz. with the closer spacing. However, yields of 12- to 16-oz. tubers and of tubers of 16 oz. and above rose as the distance increased between hills. The total net yield of tubers weighing 3 oz. and above was practically the same from seed planted 8, 10, and 12 in. apart, but averaged less for sets spaced 14 in. apart. In 2 of the 4 yr. this variety developed hollow heart and growth cracks, which increased as the hills were farther apart.

Seed of Triumph potatoes produced similar yields when spaced 8, 10, and 12 in. apart and somewhat less from 14-in. spacing. The yield of Triumph tubers weighing 12 oz. and above was very small, no hollow heart occurred, and the amount of growth cracking was unimportant. Spacing of Triumph seed had little effect on the yield of second-growth tubers, although there was a slightly larger yield as the distance between hills was increased.

Commercial fertilizers for potatoes in the Kansas River Valley, A. L. CLAPP, H. E. MYERS, and F. L. TIMMONS (*Kansas Sta. Circ. 174 (1935), pp. 12, fig. 1*).—Fertilizer tests (1931–34) in cooperation with growers, made on soils representing major potato-producing types in the eastern Kansas River Valley, showed that a combination of nitrogen and phosphoric acid at the rate of 150 lb. per acre of 15–30–0 fertilizer produced a profit more consistently than any other fertilizer tested. Nitrogen and phosphoric acid at the rate of 200 lb. of 11–48–0 per acre returned the highest profit in years of high yields. Potash did not increase yields enough to pay the added fertilizer cost, and nitrogen alone and phosphoric acid alone caused a loss in each of 3 yr. tested. It is pointed out that commercial fertilizers should be applied in a band on each side of but not touching the set, and that use of commercial fertilizers should not eliminate the growing of green manure crops in rotation with potatoes.

The soya bean: Its history, cultivation (in England), and uses, E. BOWDIDGE (*London: Oxford Univ. Press, 1935, pp. [XIII]+83, pls. 18*).—Practical information is presented in this book on the status of soybean culture in Great Britain and elsewhere, a description of the plant and varieties grown in England, cultural and harvesting practices, soybean hay and its feeding value, the value of the crop for soil improvement, and byproducts and food products of the soybean.

Breeding and selection of sweet potatoes, M. G. TIOUTINE (*Jour. Heredity, 26 (1935), No. 1, pp. 2–10, figs. [4]*).—The pollination and technic of hybridization of the sweetpotato are described from studies at the U. S. S. R. Research Institute of Subtropical Cultures, with notes on certain Hawaii Experiment Station hybrids and interspecific hybrids.

Tobacco Substation at Windsor, report for 1934, P. J. ANDERSON, T. R. SWANBACK, and O. E. STREET (*Connecticut [New Haven] Sta. Bul. 367 (1935), pp. 101–145, figs. 11*).—Reports are made on several experiments with cigar leaf tobacco (E. S. R., 71, p. 318) and also on articles noted on pages 196 and 206 in this issue.

Further experiments with phosphatic materials in the fertilizer (pp. 108–113).—Additional tests (1930–34) with phosphorus carriers applied at several rates per acre for Havana Seed tobacco on a Merrimac sandy loam which had not grown tobacco, at least in recent years, furnished data supplementing

that reported for 1922-26 in Bulletin 7 (E. S. R., 57, p. 333). Results obtained during the 10 yr. failed to show any benefit in quantity or in quality of leaf derived from the addition of phosphatic fertilizers (superphosphate and precipitated bone) on this type of land, except for a slight increase the first year on new land. In certain quality characteristics, as vein and texture, there was some evidence of impairment rather than improvement through increase of fertilizer phosphorus. Concurrent laboratory tests of thousands of soil samples from fields of tobacco growers all over the Connecticut Valley showed most of them to be similar to the station soil in phosphorus supply and availability. Chemical tests are advised for fields questionable as to phosphorus supply.

Field tests on quantity of fertilizer nitrogen (pp. 113-117).—When the nitrogen in complete fertilizer was applied, 1932-34, in organic forms at rates of 100, 150, 200, 250, and 300 lb. per acre, the best quality was produced with 200 lb. of nitrogen, although if a high yield is desired regardless of quality, 300 lb. appeared better. As the quantity of nitrogen was reduced the leaves became more yellow, dead, and unsuitable for cigars until the point was reached where they were worthless, and the yield also declined. As the quantity of nitrogen was increased the leaves became thicker, darker, more gummy, and the veins more prominent, the yield being increased chiefly by increased thickness of leaves.

Effect of shade cloth on light intensity (p. 143).—With outdoor light intensities of 800 to 1,000 candles per square foot, the average reduction in the shade cloth tent was 300 candles per square foot, or 34 percent reduction. With intensities of 600 to 700 candles in the open, reductions exceeded 400 candles, or 64 percent. On cloudy days with intensities of 300 candles or less per square foot, the reduction was necessarily less than the total light, yet nearly 50 percent of the total in the open.

Quantity of seed produced by a single plant of Broadleaf (pp. 144, 145).—Studies on 25 good plants of Broadleaf showed the pods per plant to average 302, the weight of seed per plant 75.5 g, and the number of seed per gram 12,250, or about 924,875 seeds per plant.

Vetch culture and uses, R. McKee and H. A. Schoth (*U. S. Dept. Agr., Farmers' Bul. 1740* (*1934*), *pp. 22, figs. 9*).—The characteristics, uses, adaptation, cultural and harvesting requirements, pasture value, diseases and insect pests, and other information in regard to vetches are set forth, with descriptions and a determinative key for commercial vetches. This is a revision of and supersedes Farmers' Bulletin 515 (E. S. R., 28, p. 337).

Legume inoculants and good farmers, A. W. Hofer (*Farm Res.* [*New York State Sta.*], *1* (*1935*), *No. 3, pp. 7, 11*).—The merits of inoculation of legumes are indicated, with remarks on improvements in commercial inoculants as evidenced by station tests.

Bindweed eradication, T. A. Kiesselbach, P. H. Stewart, and D. L. Gross (*Nebraska Sta. Circ. 50* (*1935*), *pp. 8, figs. 4*).—Practical information is given on the characteristics of bindweed (E. S. R., 72, p. 45), its prevalence and spread, and on its control by clean fallow and sodium chlorate treatment and by other methods.

HORTICULTURE

[Horticultural studies by the New Haven Station] (*Connecticut* [*New Haven*] *Sta. Bul. 366* (*1935*), *pp. 84, 85, 86, 88*).—Among experiments discussed briefly are those relating to the breeding of sweet corn, squash, peppers, and strawberries; the improvement of lima beans and of New York lettuce by pure

line selections; the effect of heterosis on the yield of tomatoes; and the fertilizer requirements of lettuce and other vegetables.

[Horticultural studies by the Florida Station] (*Florida Sta. Rpt. 1934, pp. 61–69, 82, 83, 89–91, 122–125, 129, fig. 1*).—Reports are presented on studies of the response of pecan varieties to different soils and in different localities, fertilizers for pecans, stocks for pecans and walnuts, and cover crops for pecans, all by G. H. Blackmon; propagation, planting, and fertilizing of tung-oil trees, preservation of citrus juices and pulps, and fundamental physiology of citrus fruit production, all by A. F. Camp; native and introduced ornamentals and their propagation, and relation of nitrogen absorption to food storage and growth in pecans, both by Camp and Blackmon; phenology of truck crops, by M. R. Ensign; varieties of avocados, blackberries, and grapes, by Camp and H. S. Wolfe; cold storage of citrus fruits, by Camp and Stahl; effect of zinc and other unusual minerals on the growth of horticultural plants, by Camp; citrus progeny and bud selection, by J. H. Jefferies; fruit and forest tree trials at the Everglades Substation, by R. V. Allison, G. R. Townsend, and R. M. Lobdell; avocado culture and rootstocks for citrus, both by Wolfe; fertilizer studies with mangoes, by Camp and Wolfe; and culture, fertilization, and varieties of tomatoes, by Wolfe and W. M. Fifield.

[Horticultural studies by the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 46, 47, 48–51, 59–61, 63, 64, 69, figs. 6*).—In the usual manner (E. S. R., 71, p. 192) brief progress reports are given on studies in orchard soil management, spraying materials, comparative value of stationary and portable sprayers, spray residue removal, storage of apples, plum varieties, manurial substitutes for greenhouse crops, improvement of tomato seed stocks, factors influencing quality of canning tomatoes, marketing of fruits and vegetables, photoperiod effects on the blooming of greenhouse plants, nitrogen and carbohydrate metabolism in the aster as influenced by the photoperiod, effects of cultural treatments on growth and reproduction of the apple, pumpkin varieties and factors affecting their canning quality, and costs, as determined at the Moses Fell Annex Farm, of washing residues from apples.

[Horticultural investigations on the Newlands, Nev., reclamation project], E. W. Knight (*U. S. Dept. Agr., Tech. Bul. 464 (1935), pp. 22, 24–29, fig. 1*).—Brief reports are given of studies on the culture of cantaloups, tomatoes, peas, beans, cucumbers, onions, several other vegetables, and fruit crops.

[Horticultural studies by the New Jersey Stations] (*New Jersey Stas. Rpt. 1934, pp. 23–31, 45–58*).—Included are reports of studies on cranberry and blueberry fertilization; control of cranberry false blossom; blueberry tillage; peach breeding; hardiness of peach varieties; freezing preservation of peaches; growth behavior in different apple varieties; temperature records in the winter of 1933–34; strawberry breeding; new varieties of small fruits; effect of soil acidity on the growth of the strawberry; mulching of strawberries; winter injury to grapes and small fruits; tomato breeding; factors affecting the quality of tomato juice; asparagus breeding; nutritional requirements of onions; strains of tomatoes; varieties of sweet corn; culture of greenhouse roses, carnations, sweet peas, and other plants; testing of iris, dahlias, and other ornamentals; the effect of temperature on the assimilation of nutrients by peach and apple roots; the development of spray schedules permitting the successful removal of residues; and the washing of sprayed cider apples.

[Horticultural studies by the New Mexico Station] (*New Mexico Sta. Rpt 1934, pp. 49–55, 56–58, 59, 60, figs. 2*).—Brief reports are presented on the following projects: The processing of pimiento peppers; phenological and variety studies with fruits; smudging experiments; tomato variety tests; cabbage

fertilizer experiments; variety trials of pecans and grapes; fertilizer and irrigation requirements of onions, including storage tests; production of vegetable seeds; tests of pepper varieties; experiments with flowering bulbs; and cultural investigations with vegetables at high altitudes.

[Horticultural studies by the Tennessee Station] (*Tennessee Sta. Rpt. 1933, pp. 26–28, 44, 45, 54, 55*).—Information is presented by S. H. Essary on the breeding and testing of wilt-resistant tomatoes and by B. D. Drain on the breeding of raspberries and strawberries, testing of peach and other fruit varieties, propagation of pyrethrum, crown rot resistance in rhubarb, irrigation of vegetables, okra varieties, lilac varieties on privet roots, and rose stocks. In addition comments are included by B. P. Hazlewood of the West Tennessee Substation on variety tests of peppers, okra, peaches, and apples, and the resistance of rhubarb to crown rot.

Subsistence farm gardens, W. R. Beattie, J. W. Roberts, L. L. Harter, W. H. White, and D. L. Van Dine (*U. S. Dept. Agr., Farmers' Bul. 1746 (1935), pp. II+54, figs. 21*).—Starting with a general discussion of the principles and practices of gardening, including such items as soil preparation, watering, seed sowing, and disease and insect control, specific information is given on the requirements of various important vegetable and fruit crops.

Hotbeds and coldframes, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1743 (1935), pp. II+29, figs. 17*).—This is a general discussion of the principles and practices of plant production in heated and unheated frames. Included are sections on the electric heating of beds and plant houses and also specific information for the handling of various important vegetable crops.

Determining changes in stored material by use of a reference element, C. S. Bisson and H. A. Jones (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 122–124*).—To demonstrate the value of using as a standard of comparison an element such as phosphorus, which does not undergo change in weight during storage, the authors present data on the absolute weight of the constituents of shelled peas stored for different periods at 25° C. and calculated on the basis of initial weight of stored samples with phosphorus as a basis. The inability to account for the full loss of sugars on the basis of respiration led to the suggestion that part of the sugar may have been used in building up additional starch, crude fiber, or possibly other undetermined carbohydrates.

The production of winter vegetables in the Lower Rio Grande Valley, W. H. Friend (*Texas Sta. Circ. 73 (1934), pp. 39, figs. 6*).—With occasional winters with no freezing, the climate of the Lower Rio Grande Valley is said to be generally favorable to the production of hardy and semihardy vegetables. Information is offered on the choice of crops, preparation of the soil, planting, culture, harvesting and marketing, control of pests, and the specific requirements of the individual crops.

Choosing fertilizers for vegetable crops, C. B. Sayre (*Farm Res. [New York State Sta.], 1 (1935), No. 3, pp. 1, 2*).—General information is presented on the results of 9 yr. of experiments with different combinations and amounts of fertilizers for vegetable crops, including tomatoes, beans, beets, peas, sweet corn, and cabbage.

Plant late to make red beets redder, W. D. Enzie (*Farm Res. [New York State Sta.], 1 (1935), No. 3, p. 2*).—Most of the available strains of Detroit Dark Red beets were found to develop darker and more intense color when planted late in the season. A delay in harvest in late summer tended also to intensify color. Muck soils which had been tilled for several years produced darker beets than did freshly cleared areas. Certain strains were observed to have higher color than others.

Premature seeding in inbred lines of celery, S. L. Emsweller (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 155–159*).—Celery plants, largely of the Golden Plume variety, selected by the California Experiment Station for their tendencies to rapid or to delayed formation of flower stalks were selfed and studies made of the bolting characteristics of the progeny. The possibility was shown of developing strains that will not bolt readily under conditions favoring this phenomenon. Certain strains possessed a tendency to annual flowering so strongly that some plants produced seed stalks under the most favorable conditions for vegetative growth. The data, though incomplete, indicate that the genetic situation for nonbolting is quantitative and also recessive.

Muskmelons (*Farm Res. [New York State Sta.], 1 (1935), No. 3, p. 11*).—Popular information is presented on several desirable varieties.

The use of flies as onion pollinators, H. A. Jones and S. L. Emsweller (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 160–164, figs. 3*).—In addition to discussing certain improvements in the manner of propagating and handling flies and of caging the plants, the authors present data showing the effectiveness of the fly method of pollination in seed production. In both the Stockton Yellow Globe and the Australian Brown varieties the yield of selfed seed was greatly increased by fly pollination as compared with bagging and tapping; in fact the yields of seed obtained with flies were very similar to those secured with open pollination. Flies were also effectively used in crossing different varieties.

Moisture content of different varieties of onions, H. A. Jones and C. S. Bisson (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 165–168*).—Determinations at the California Experiment Station of the dry weight of various varieties of onions grown under comparable conditions showed wide differences, ranging from about 5 percent dry matter in Sweet Spanish to 16 percent in the Red and White Creole. In general, onions with high moisture were mild in flavor and of rather poor storage quality. Some indication was obtained that onions grown in peat soils have a higher moisture content than those grown in mineral soils.

Further experiments on spray residue removal, F. L. Overley, E. L. Overholser, J. L. St. John, and K. Groves (*Wash. State Hort. Assoc. Proc., 30 (1934), pp. 77–82*).—Trials of various commercial washing machines and washing materials indicated that fruit sprayed with lead arsenate in sufficient quantity to control the codling moth is difficult to cleanse below the tolerance, thus suggesting the need of using the best available washers and methods. When from 8 to 10 sprays were applied with lead and fish oil a tandem wash of hydrochloric acid and sodium silicate was necessary to reduce residues below the tolerance. The addition of Vatsol or mineral oils to the hydrochloric acid and vegetable oil soap to the sodium silicate increased their effectiveness. The warming of the rinse water apparently improved the efficiency of the washes. Three types of fruit injury were noted, (1) scalding from high temperature, (2) cracking of skin from high temperature, and (3) lenticel injury from arsenic.

The control of fruit pests, C. O. Eddy, W. D. Valleau, and W. W. Magill (*Kentucky Sta. Bul. 353 (1934), pp. 201–239*).—A discussion is presented of various insecticides and fungicides and combinations thereof, and of important pests of the apple, peach, cherry, grape, strawberry, and raspberry. Schedules are included for certain of the more important fruits.

Fruit-breeding [studies by the South Dakota Station], N. E. Hansen (*South Dakota Sta. Rpt. 1934, pp. 40–42*).—Information is presented on new

varieties, introduced in the spring of 1934, of apricots, apples, plums, and sand cherry-plum hybrids.

Effect of pollen on fruit quality, B. R. NEBEL (*Farm Res.* [*New York State Sta.*], *1* (*1935*), *No. 3, pp. 1, 3, fig. 1*).—This paper, largely covered in an earlier and more technical account (E. S. R., 72, p. 462), states that the application of Red Astrachan, Yellow Bellflower, and crab apple pollens to McIntosh flowers resulted in certain nonobvious but measurable differences in size, acid content, sugar content, and keeping quality. No effects on color were discerned. The author emphasizes the fact that the differential effects recorded were so small as to have little practical consideration.

Irrigation of orchards, L. L. CLAYPOOL (*Wash. State Hort. Assoc. Proc., 30* (*1934*), *pp. 98–104*).—Irrigation experiments conducted at Prosser by the Washington Experiment Station indicated the advisability of maintaining the soil moisture above the wilting point throughout the growing period. Trees which suffered from a lack of water during the early part of the season made less terminal and trunk growth than those receiving adequate moisture. The same total water applied at 30-day intervals proved more satisfactory than at 15-day intervals. A total of 40 acre-in. of water penetrating the soil gave almost as good results as did heavier applications. Irrigation had little influence on the color of fruit, the reduction being generally offset by the higher quality of the color.

The dry-matter residue of trees and their products in proportion to leaf area, W. H. CHANDLER (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *Sup., pp. 39–56, figs. 6*).—*Studies begun at Cornell University and continued at the University of* California in which various fruit trees, including the apple, pear, peach, apricot, fig, and persimmon, were part deflorated and part permitted to fruit showed that fruiting, including seed formation, requires less leaf surface to produce a given amount of dry matter than is required to form the same dry weight of wood. Fruiting reduced the amount of root and top growth from a given leaf area, but the reduction was not nearly so great as the dry weight of the fruit. Three possible explanations are set forth, (1) photosynthesis in the fruit itself, (2) inhibition of photosynthesis in the leaves of deflorated trees caused by an accumulation of products of photosynthesis, and (3) a lesser use of food for respiration in the living cells of fruit than of wood. Of the various fruits the Elberta peach made the most rapid growth and at the same time had the smallest root weight in proportion to top weight and to leaf surface. Data on the fig, though somewhat limited, indicated that seedless fruits reduced growth as much as those producing seeds. The author points out that an average crop of fruit may not reduce growth to the extent brought about by crowding of the trees or unfavorable soil and climate.

Leaf area and fruiting, R. H. ROBERTS (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *Sup., p. 32*).—Determinations of the average size of large leaves on the same varieties of apples growing in Washington and Wisconsin showed the Washington foliage to be much larger. The author suggests that these differences may account for the larger yield and larger fruit sizes in the Washington area.

Progress report of fertilizer studies with apples, F. L. OVERLEY and E. L. OVERHOLSER (*Wash. State Hort. Assoc. Proc., 30* (*1934*), *pp. 45–49*).—In this further discussion (E. S. R., 71, p. 194), the Washington Experiment Station reports that Jonathan apple trees receiving nitrogen alone or combined with phosphorus or potassium singly or together made a greater average annual terminal growth than did the trees of check plats or those receiving phosphorus or potash, or both. Trees receiving nitrogen alone made a slightly greater terminal growth than where the nitrogen was combined with phosphorus

and potassium; in fact phosphorus and potassium alone or combined tended to reduce terminal growth slightly below the controls. Annual increment in trunk circumference was somewhat greater in the nitrogen plats than in the controls. Nitrogen alone or combined increased the percentage of fruit set, but fertilizers did not significantly influence the alternate bearing tendency or the susceptibility of fruit buds to winter injury. Nitrogen alone or combined tended to increase average annual production and the average size of fruits. The yields on phosphorus and potassium plats were comparable to those of the controls. Phosphorus or potassium and phosphorus plus potassium tended to decrease the size of Jonathan apples below the controls. Nitrogen alone or combined tended to decrease the percentage of red color.

The lifetime yield of an apple orchard, J. K. SHAW (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 35–38, fig. 1*).—In presenting the total yields over a 32-yr. period of an experimental orchard composed of Rhode Island Greening, Roxbury Russet, Baldwin, and Gravenstein varieties, the author points out that Rhode Island Greening was the most productive variety and that Baldwin failed to maintain its percentage contribution of yield in the later years, whereas Gravenstein forged ahead. Stable manure proved the most effective fertilizer throughout. Potash and phosphorus fertilizers maintained yields above those of the control.

A simplified method of determining freezing-point depressions of apple tissue with the Beckmann apparatus, L. VERNER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 33, 34*).—The use of cup-shaped pieces of tissue rather than the customary expressed juice greatly reduced the time required to make freezing-point depression readings and dispensed with the usual operations of prefreezing, trituration, and pressing. The freezing-point depressions were generally slightly greater than corresponding readings on expressed juice.

Water-core, C. P. HARLEY (*Wash. State Hort. Assoc. Proc., 30 (1934), pp. 105–108*).—Experiments in which Winter Banana and Gano apples were covered with black and white cambric and cellophane to bring about different internal temperatures showed a positive correlation between temperature and the occurrence of water core. The affected tissues were found to undergo a rapid starch to sugar conversion and at later stages to contain appreciable quantities of ethyl alcohol, indicative of anaerobic respiration. The sudden exposure of fruits to direct sunlight tended also to promote water core. Although some recovery occurred in storage, fruits with a relatively large area solidly affected rarely returned to a fully normal condition.

Pruning stone fruits—peaches, cherries, and plums, T. J. TALBERT (*Missouri Sta. Circ. 183 (1935), pp. 12, figs. 8*).—General information is presented on principles and practices.

Ice formation in the fruit bud of the peach, M. J. DORSEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 22–27*).—Microscopic studies at the Illinois Experiment Station of Gage and Elberta peach buds held in cold storage where the temperature was lowered slowly showed ice crystals in the bud scales after from 8 to 10 hr. at 28° F. Holding 0.5 hr. at 27° caused the formation of ice crystals in the scale tissues to the extent that they could be seen at low magnification. Apparently ice forms and melts in peach buds many times each winter. At low temperatures the mass of ice in the basal scales and pith core were so extensive as to give the buds a plump appearance. In freezing, the water held in the cells was apparently drawn away from the rudimentary flower parts to other tissues, tending to increase the concentration of the cell fluids and depress the freezing point. Observations following the breaking of the rest period and the resumption of growth showed ice to form first in the calyx tube. Ice was not seen in the pistils at temperatures above the killing point.

The formation of ice at temperatures above the killing point is apparently not particularly harmful in certain tissues. Obviously the mechanism in the peach fruit bud for the withdrawal of water from the meristematic to the nonmeristematic tissues constitutes an important function in cold endurance. The author suggests that killing is due to excessive water removal, which in turn brings about an injurious concentration of the cell liquids.

The development of the peach fruit, with special reference to split-pit and gumming, C. H. Ragland (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 1–21, figs. 18*).—In presenting in detail the results of cytological studies at the California Experiment Station on the developing fruit of Phillips Cling and Muir peaches from differentiation of the flower bud to the ripe fruit, the author states that fall and winter development proceed essentially as found by investigators in other sections, except for such differences as might be expected from the climate. In all 3 yr. of the study the nonfunctional ovule aborted before fertilization in both varieties, apparently as a result of nutritional conditions. Chance apparently decides which of the two ovules aborts. Since the development of the ovule and embryo of the Phillips Cling was almost identical with that of Muir, a variety which does not produce gummy fruits or a large percentage of aborted embryos, the author concludes that embryo abortion in Phillips Cling does not result from irregularities in development. Studies of the arrangement and nature of the vascular bundles suggested a possible association between gumming in Phillips Cling and the disintegration of the dorsal or ventral bundles. Splitting of pits may be caused by forces exerted upon the pit by the growing cells of the flesh.

Enzymatic darkening in apricots, R. Samisch and W. V. Cruess (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 28–31, fig. 1*).—The rapid darkening of apricots when dried without protective treatment is ascribed by the California Experiment Station to the existence of a complete enzyme-substrate system capable of producing a brown color. The steaming of apricots for 5 min. did not decrease the rate of darkening. Only the anions of neutral salts were found to inhibit the oxidase of apricots. Ascorbic acid, commonly known as vitamin C, apparently played a part as a natural reducing agent in preventing darkening of the tissues.

Winter injury to fruit and nut varieties in New York State (*New York State Sta. Circ. 156 (1935), pp. 18, figs. 3*).—Herein is discussed the response of various species and varieties of fruits and nuts to the unusually low temperatures of the winter of 1933–34, and the relation of certain genetic and cultural factors to the extent of the injury. In the apple, varieties with triploid chromosomes suffered as a group more severely than did those of diploid structure. The wood of the triploids was found, on the average, to be stockier and coarser in cell structure than that of the diploids. Pears as a class were less hardy than apples, but there were noted varieties hardier than the tender varieties of apples. The Japanese-type plums proved less hardy than the European. Sour cherries when well cultured came through with little injury. At Fredonia where certain grapes, such as Agawam, Catawba, and Iona, lost 100 percent of their fruit buds, Concord proved hardy, with only a 12-percent loss. Observations are also included on bush fruits, strawberries, and nuts. Rootstocks were not greatly harmed, if at all, in the principal fruit regions.

Bud mutation in the vinifera grape.—I, "Parthenocarpic" Sultanina, H. P. Olmo (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 119–121, fig. 1*).—In a block of 4-year-old Sultanina grapevines growing at Davis, Calif., there were discovered six extra vigorous plants bearing clusters with comparatively few berries, and these of small size and spherical shape. No abortive seeds were present, and the pollen, though normal in appearance, was extremely

low in viability. In 1934 the average yield of the mutants was less than one-fourth of the normal. The occurrence of these undesirable mutants suggests the importance of knowing the parent vines from which cuttings are to be taken.

Blueberry culture in Massachusetts, J. S. Bailey and H. J. Franklin (*Massachusetts Sta. Bul. 317 (1935), pp. 19, figs. 8*).—General information is given on varieties, propagation, pruning, culture, pest control, and marketing of improved named blueberries. In addition there are discussed briefly the results of experiments conducted at several locations with wild highbush blueberries. The removal of competing vegetation increased growth. Moderate pruning was found desirable, but severe pruning was harmful. Fertilizers, particularly nitrogen, increased growth and yield, and a combination of fertilization and pruning was particularly effective. The increased yield from fertilizers was chiefly due to a greater number of berries. Fertilizers tended to increase annual bearing tendencies and to make the fruits firmer during dry weather. An annual terminal shoot growth of about 10 in. was most favorable.

Notes on polyembryony and multiple shoots from the seed in Mangifera indica, C. H. Arndt (*Amer. Jour. Bot., 22 (1935), No. 1, pp. 26–30, pls. 2*).—Multiple shoots observed in germinating mango seeds are believed to originate through polyembryony or the development of adventitious buds on the seedlings before or during germination, or both.

The herb garden, G. P. Van Eseltine (*New York State Sta. Circ. 157 (1935), pp. 10, fig. 1*).—Information of a general nature is presented on culture and propagation, methods of preservation, and the characteristics and uses of various species of herbs.

The rock garden vs. the rock pile, L. M. van Alstyne (*Farm Res. [New York State Sta.], 1 (1935), No. 3, p. 6, figs. 2*).—Useful information is presented on the planning and construction of rock gardens.

FORESTRY

[Forestry discussions at the Fifth Pacific Science Congress] (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vols. 1, pp. 511–571, figs. 11; 2, pp. 961–1024, fig. 1*).—There are included the following papers relating to forestry: Plant Indicators Relating to Silviculture in Japan, by M. Kawada (pp. 511–514); A Study on the Rejuvenation of the Pine Forest, by K. Morikawa (pp. 515–521); Plant Succession in Relation to the "Genya" (Natural Grass-lands) Management in Japan, by M. Ohsako (pp. 523–525); The Application of the Biological Sciences to the Problem of Growing Crops, by C. Coster (pp. 527–530); The Recent Application of Science and Engineering to Forestry, by F. M. Knapp (pp. 531–541); The Chemistry of Wood in Relation to Present and Possible Use, by E. C. Sherrard (pp. 543–546); Some Observations on the Economic Aspects of Forestry, by H. R. MacMillan (pp. 547–550); The Need of Basic Research for the Solution of Our Forest Problems, by C. D. Howe (pp. 551–557); Forestry and Science, by E. H. Finlayson (pp. 559–566); Recent Applications of Science to Forestry, by R. Y. Stuart (pp. 567–571); Forest Resources of Japan, by M. Fujioka (pp. 961–971); The Regeneration of Conifers in Korea, by H. Uyeki (pp. 973–979); Recent Forestry Progress in China, by D. Y. Lin (pp. 981–991); Forest Resources of New Zealand, by M. Sutherland (pp. 993, 994); The Forest Resources of the Pacific Slope, by F. E. Ames (pp. 995–1006); Forest Resources of the West Coast of Mexico, by J. Purres (pp. 1007–1012); Forest Conditions and Timber Reserves in Netherlands Indies,

by F. H. Endert (pp. 1013–1019); and Pacific Coast Woods as a Source of Material for Pulp and Paper, by P. Z. Caverhill (pp. 1021–1024).

[Forestry studies by the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 41–44, figs. 3*).—Included are brief reports of studies in woodlot management, growing of transplanting stock, value of windbreaks on muck soils, and the marketing and transportation of basket stock.

Sample plots in silvicultural research (*U. S. Dept. Agr. Circ. 333 (1935), pp. 91, pls. 8, figs. 5*).—Stating that the sample plat method had been found to be the most effective way of studying the growth and behavior of forest stands, this circular presents foresters with an outline of the technic of sample plat procedure. Among subjects discussed are plat establishment, marking of individual trees, plat protection, and the collection of data. Appended are typical field forms, lists of essential equipment, abbreviations used, methods of preparing volume and yield tables, etc.

Statistical analyses for finding a simple method for estimating the percentage heart rot in Minnesota aspen, R. M. Brown (*Jour. Agr. Res. [U. S.], 49 (1934), No. 10, pp. 929–942, figs. 2*).—On the basis of original data taken on 77 sample plats in well-stocked and understocked stands distributed throughout northern Minnesota and on tree and rot measurements on 236 dominant trees cut in these stands, the Minnesota Experiment Station, through the application of a combination multiple linear and multiple curvilinear method of analysis, established that the percentage of rot in dominant aspen trees can be estimated more simply and just as accurately by the use of rot diameter alone as any other method. For 25 trees bearing fruiting bodies the number of fruiting bodies was not correlated significantly with rot percentage, but the maximum height of the fruiting bodies was correlated positively. The percentage of total rot in dominant trees was highly and positively correlated with age, total height, diameter at breast height, and rot diameter and less closely with depth to rot. No statistical evidence was found to show that rot percentage varied with site index nor with site index when the linear effect of age was eliminated. Rot percentage decreased with site index in stands having the same rot diameter and total height. There was no evidence that rot percentage varied with soil types. The author concludes that from a practical viewpoint site need not be considered when the percentage of rot is estimated in the dominant trees. He suggests a rule of thumb, namely, rot percentage equals 3.5 rot diameter, for determining the percentage of intermediate plus final rot (8 in. in diameter and less) in merchantable trees.

Effect of fire and grazing on soil properties and the natural reproduction of longleaf pine, W. G. Wahlenberg (*Jour. Forestry, 33 (1935), No. 3, pp. 331–337*).—Observing that the natural range of the longleaf pine is receding from its exterior borders and from other pine areas within the general longleaf territory, studies were made of various causes. At McNeill, Miss., the exclusion of fire for 7 yr. improved the physical properties of the soil but decreased the available supply of nitrogen, replaceable calcium, and organic matter as compared with burned areas. In greenhouse tests slash pine seedlings grew better in soil that had been burned over. Protection from fire and grazing resulted in the highest survival of longleaf seedlings, but severe stunting of the entire stand demonstrated the futility of these precautionary measures. Three major factors, namely, poor soil, heavy infestation with brown spot needle disease, and improper use of fire, are believed to contribute to stunting. Moderate cattle grazing is conceded to be harmful only in the first year after germination. Present indications point to the beneficial effect of light burnings after the first season, both in aiding the young trees to emerge from

the competing grasses and in checking the epidemics of brown spot. The author concludes that the whole subject of burning needs intensive study.

Relation between winter grass fires and cattle grazing in the longleaf pine belt, S. W. GREENE (*Jour. Forestry, 33 (1935), No. 3, pp. 338–341*).—At McNeill, Miss., cattle grazed on annually burned-over longleaf pine lands gained an average of 101 lb. per year over an 11-yr. period as compared with 69 lb. on the unburned range. Temperature readings taken for a period of 30 days in 1926 at a depth of 3 in. showed the average maximum temperature to be 5.5° F. higher on the burned area. Native legumes were more abundant on the burned than on the adjacent unburned plats. Analyses of the foliage showed crude protein to be higher and crude fiber to be lower on the burned areas. Lime and phosphorus contents were also higher in the foliage of the burned plats.

A naval stores handbook dealing with the production of pine gum or oleoresin (*U. S. Dept. Agr., Misc. Pub. 209 (1935), pp. 201, pls. 10, figs. 80*).—This handbook is designed to present in cyclopedic form an up-to-date summary of information on where and how pine gum or oleoresin is obtained from living trees, with suggestions for improving production methods. Among items discussed are pine species yielding naval stores; the physiology of oleoresin and its production in the tree; methods of obtaining gum; forest management of slash and longleaf pines; effects of fire, grazing, insects, and fungi; and production in other countries. A list of 581 citations to the literature is appended.

DISEASES OF PLANTS

Diseases of plants in the United States in 1933, compiled by H. B. HUMPHREY and J. I. WOOD (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1935, Sup. 86, pp. 107, figs. 21*).—This summary includes only information based on reports made to the Plant Disease Survey by more than 175 collaborators and contributors from the various States and from Hawaii and Puerto Rico.

Following the introduction appear maps of the United States, depicting the departures from normal temperatures and the percentages of normal precipitation in each State for each of the four seasons. Charts show accumulated temperatures and precipitations for the year as compared with the normal for Harrisburg, Pa., Atlanta, Ga., Little Rock, Ark., Bismarck, N. Dak., Portland, Oreg., and Sacramento, Calif.

In succession are discussed the diseases of cereal crops, forage crops, fruit and nut crops, vegetable crops, special crops (tobacco, cotton, peanuts, and hops), sugar crops, trees, ornamentals, and eelgrass. There is an index.

The Plant Disease Reporter, January 15, February 15, March 1, and April 1, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), Nos. 1, pp. 10; 2, pp. 11–20; 3, pp. 21–28; 4, pp. 29–38, fig. 1*).—Among other items of current interest, these issues contain the following:

No. 1.—Notes on the effect of 1934 high temperatures and drought on the fruit crop (apples, peaches, and sour cherries) of the Ozarks section of Missouri and Arkansas, by J. C. Dunegan and M. A. Smith; *Botrytis* (*B. convoluta*) rhizome rot of iris in Minnesota in 1934, by L. Dosdall; the sugar beet nematode, *Heterodera schachtii*, on oats in Canada (in Ontario); and *Diplodia macrospora* on corn in Brazil, by H. Johann.

No. 2.—The entry and movement of elm burl logs (into the United States), by R. K. Beattie and A. E. Verrall; *Cytosporina* canker on American elm in Illinois nurseries (tentatively diagnosed as *C. ludibunda*), by J. C. Carter; cankers of hardwoods (*Nectria* and *Strumella* in the eastern United States); the *Atropellis* canker of eastern pines, by J. D. Diller; some diseases of orna-

mentals in Oregon (*Heterosporium gracile* leaf spot of bulbous iris, calla lily mosaic, and *Phomopsis crustosa* canker on holly), by F. P. McWhorter; and notes on some diseases of rye grasses (*Lolium* spp.) in western Oregon, by R. Sprague.

No. 3.—Summary of the situation regarding the azalea flower spot (due to an undescribed fungus), by F. Weiss; observations on nematode diseases of plants (including *Heterodera marioni* on green foxtail grass (*Chaetochloa viridis*) and puncture weed (*Tribulus terrestris*)), *Anguillulina dipsaci* on *Tigridia aurea*, and *T. pavonia speciosa* (imported from the Netherlands), and *A. pratensis* (seriously affecting potato (*Solanum tuberosum*) in Virginia and Mississippi), by C. Steiner and E. M. Buhrer; some observations on transfers of the bulb or stem nematode (*A. dipsaci*), by W. D. Courtney; miscellaneous notes on some nematode diseases of plants in British Columbia, by R. J. Hastings; and peach virus diseases (yellows, littles, and red suture) in Michigan in 1934.

No. 4.—Hitherto unreported hosts of the root-knot nematode (all but one from Hawaii), by G. H. Godfrey; the present situation regarding eelgrass (*Zostera marina*), by C. Cottam; and varietal tests with cotton wilt in Arkansas, 1934, by V. H. Young.

[Plant disease studies in Connecticut] (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 64, 65, 72–75, 82, 93*).—Brief reports are given on the following investigations; The Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in Connecticut and its newly-found carrier beetle, *Hylurgopinus rufipes*; the progress of chestnut blight (*Endothia parasitica*); the "X" disease (cause unknown) of peach trees; increased potato yields from bordeaux mixture; control of late blight of tomato (*Phytophthora infestans*) by bordeaux mixture and red-copper-oxide sprays; seed and soil treatments v. sand culture for the control of preemergence and postemergence damping-off of seedlings; bacterial wilt (*Aplanobacter stewarti*) of corn; nematode injury (*Aphelenchoides fragaria*) on chrysanthemums and *Monilochaetes infuscans* on sweetpotato; the effects of severe low temperatures of the winter of 1933–34 on trees and shrubs, the effects of the moist weather of early spring and fall on elm black spot (*Gnomonia ulmea*), rust of apples (*Roestelia pyrata=Gymnosporangium juniperi virginianae*), and late blight of tomato and potato (*Phytophthora infestans*). Reference is also made to the enlarged program of white pine blister rust (*Cronartium ribicola*) control and to the tobacco disease survey in 1934.

[Plant disease studies in Florida] (*Florida Sta. Rpt. 1934, pp. 51, 52, 71–74, 75–82, 84, 100, 101, 106, 107, 111, 112, 116, 117, figs. 3*).—Brief summaries are given of the results of studies on the following subjects: Elimination of root knot (*Heterodera marioni*) by starvation through the use of *Crotalaria spectabilis*, control of root knot by cyanamide, and host susceptibility of wild and cultivated plants to root knot, by J. R. Watson; the effect of bordeaux mixture used against downy mildew of cucurbits on the set of fruit, by G. F. Weber; host range and conditions favoring *Rhizoctonia* bud rot of strawberry, control of *Sclerotium* blight of strawberry, and *Diplodia* root rot of strawberry, by A. N. Brooks and R. E. Nolen; *Sclerotinia sclerotiorum* stem rot of potato, *Fusarium* seed-piece decay of potatoes, and varietal susceptibility of potatoes to *R. solani*, and alternate year soil treatment with sulfur and with lime for the control of *Bacterium solanacearum* brown rot of potatoes and closely related plants and host range and varietal susceptibility to *B. solanacearum*, both by A. H. Eddins; corn breeding for resistance to *Physoderma zeae-maydis* brown spot, and the effect of environmental factors on *D. macrospora* leaf spot of corn, host range of *D. frumenti* (*Physalospora zeicola*) and closely related forms, both by R. K. Voorhees; watermelon breeding for resistance to *F. niveum*

wilt, and downy mildew (*Peronoplasmopara cubensis*), anthracnose, *Alternaria* blight, and gummy stem blight of watermelons, both by M. N. Walker; cause and control of the so-called "rust" of *Asparagus plumosus*, by W. B. Shippy; tomato breeding for resistance to wilt (*F. lycopersici*), by Weber and D. G. A. Kelbert; *Clitocybe tabescens* mushroom root rot of citrus trees and other woody plants in Florida and its control by surgical treatment, by A. S. Rhoads; control of black spot (*Phoma destructiva*) of tomatoes in Florida and in transit by field spraying with bordeaux mixture and by dipping the fruit in fungicides, by W. B. Tisdale and S. Hawkins; strawberry wilt or crown rot (*Colletotrichum fragariae*) and its control by sprays and dusts, by Brooks; stem-end decays of citrus fruits (chiefly *Phomopsis citri* and *D. natalensis*) and their prevention by field spraying and low storage temperatures, by Tisdale and E. West, and (at the Citrus Experiment Station) by W. A. Kuntz; spray program with bordeaux mixture for the control of grape diseases in Florida, by K. W. Loucks; a bark disease of Tahiti lime trees, with which *D. natalensis* and *P. citri* are chiefly associated, by Tisdale; *Sclerotium rolfsii* in Florida, its host relations and factors influencing its pathogenicity, by West; testing of fungicides for rose disease control in Florida, by Shippy; black rot of grapes, by Loucks; melanose of citrus (*P. citri*) and its control by fungicides, by G. D. Ruehle and Kuntz; die-back (exanthema) of citrus and the use of copper sulfate against it, by B. R. Fudge; tests with fungicides in citrus scab [*Sphaceloma fawcettii*] control, by Ruehle; ring spot and eyespot (*Helminthosporium ocellum*) disease of sugarcane, red rot (*C. falcatum*) of the sheath and stem of sugarcane, and soil type in relation to sugarcane mosaic, by B. A. Bourne; biological studies of the root knot nematode (*Heterodera marioni*) in the Everglades and tests of chemicals in their control, seedling potatoes in relation to virus diseases, and treatment of pea seed with fungicidal dusts to prevent poor stands caused by *R. solani* and other fungi, and improved materials and methods for the control of early blight of celery (*Cercospora apii*) and varietal resistance to the disease, spraying and dusting for the control of carrot blight (*Macrosporium carotae*), control of bacterial blights of green beans (*Phytomonas medicaginis phaseolicola* and others), copper sprays for nail head spot of tomato (*Alternaria solani*), and the relation of potash and phosphorus fertilizers to leaf diseases of potatoes, carrots, beans, celery, and cabbage, both by G. R. Townsend; the machine application of chemicals, such as chloropicrin (tear gas) and carbon bisulfide, against the root knot nematode in the soil, by J. R. Neller, A. Daane, Towusend, and R. N. Lohdell; and the influence of soil temperature and time of transplanting to black shank of tobacco (*Phytophthora parasitica nicotianae*) and breeding cigar wrapper tobacco for resistance to black shank, both by L. O. Gratz and R. R. Kincaid.

[Plant disease studies in Indiana] (*Indiana Sta. Rpt. 1934, pp. 25–27, 47, 48, 63, 64, figs. 3*).—The results are briefly summarized of investigations on the following subjects: Tomato seed treatment with copper sulfate, red oxide of copper, and zinc oxide; seed transmission of *Fusarium* wilt of tomato; corn improvement and selection for resistance to bacterial wilt; effect of leaf rust on the yield, composition, and quality of winter wheat, physiologic forms of leaf rust, and breeding and selection of wheat for resistance to leaf rust, loose smut, and bunt; foliage injury in roses; aster wilt; and physicochemical studies of viruses.

[Plant disease studies in New Mexico] (*New Mexico Sta. Rpt. 1934, pp. 35, 39, 40, 42–44*).—Brief summaries are given of the results of investigations on wilt of chili pepper, the use of iron sulfate-aluminum sulfate combinations and other means for the control of grape chlorosis, violet root rot (*Rhizoctonia crocorum*)

of sweetpotato, resistance of tomato varieties to western yellow blight (curly top), and the nature of apple measles.

[Plant disease studies in New Jersey] (*New Jersey Stas. Rpt. 1934, pp. 58–60, 61, 63–72, 85*).—The results are given of studies on the following subjects: The addition of calomel and yellow oxide of mercury to fertilizer for the control of potato scab and *Rhizoctonia*, the value of scab disinfection of potatoes planted in soils of different pH, the yields of potato varieties in relation to virus diseases, the influence of bordeaux mixture in varying strengths and of Coposil on potato yields, and the influence of depth of planting and soil moisture content on *Rhizoctonia* attack on potato sprouts under the soil; influence of soil moisture and sprout treatment on sweetpotato stem rot, scurf, and black rot; ascospore discharge of *Venturia inaequalis* and the use of bentonite sulfur, bordeaux mixture, and Coposil as compared with lime-sulfur for apple scab and fruit spot (*Phoma pomi*) control; spraying apple blossoms with Coposil and bordeaux mixture for fire blight control; sweet corn breeding and selection for resistance to bacterial wilt (*Aplanobacter stewartii*); prevention of bacterial canker of tomato (*A. michiganense*) through seed extraction by fermentation, absence of soil transmission of tomato canker and the relation of hot water treatment to the duration of tomato seed viability; the use of hydrated lime and calcium cyanamide for the control of clubroot of crucifers; retardation of eggplant wilt due to *Verticillium* by the use of calcium cyanamide and selection and breeding of eggplant for wilt resistance; control of pea root rot with formaldehyde, followed by various fertilizers; reduction of damping-off of vegetables (*Rhizoctonia* and *Pythium*) by red copper oxide, weak formaldehyde, and by soil inoculation with a species of *Trichoderma*; the use of bordeaux mixture against raspberry anthracnose and spur blight; unsatisfactory control of rose black spot by spraying and dusting, the effect of mosaic on the Talisman rose, the use of mercury-ammonium-silicate gel with a spreader in the control of gladiolus scab (*Bacterium marginatum*) and blue mold (*Penicillium*), influence of soil acidity and value of sand culture of rhododendron for the control of wilt (*Phytophthora cinnamomi*), the control of azalea leaf scorch (*Septoria azaleae*) by Coposil sprays; the use of mercurial and formaldehyde baths for the propagating canes of *Dracaena* and *Cordyline* for the control of root rot (cause undetermined); eradication of the Dutch elm disease (*Graphium* (*Ceratostomella*) *ulmi*); the adhesiveness of sulfur sprays; *Pestalotia* investigations; *Phytophthora* studies; apple measles (*Helminthosporium* sp.); *Diachea leucopoda* on ferns; copper burning of foliage in relation to the pH of the cell fluids and the isoelectric points of plant proteins; and the relation of bacteria to the stunting of onion seedling radicles.

[Plant disease studies in Tennessee] (*Tennessee Sta. Rpt. 1933, pp. 44, 46–48*).—A brief discussion is given of the results of investigations on the chemical control of fire blight and pear breeding and selection for fire blight resistance, by B. D. Drain; and wheat head blight and root rot resistance, a new physiologic race of the cotton wilt fungus (*Fusarium vasinfectum*), strawberry black root resistance, spray experiments for apple black rot and other prevailing diseases, tests of new fungicides, spraying for fire blight control, and selection of cotton strains for resistance to *Verticillium* wilt, all by C. D. Sherbakoff.

Seed-borne diseases in Estonia [trans. title], J. Juhans (*Mitt. Phytopath. Versuchssta. Univ. Tartu, No. 19 (1934), pp. 1–13*).—The results are given of a 4-yr. investigation of seed-borne diseases in Estonia.

Mechanism of disease resistance in plants, W. Brown (*Brit. Mycol. Soc. Trans., 19 (1934), pt. 1, pp. 11–33*).—This is a critical discussion of present evidence concerning the mechanism of penetration by the parasite and of internal resistance, both mechanical and chemical, on the part of the invaded plant, with consideration of the enzymic theory of parasitism.

Researches on fungi, IV–VI, A. H. R. Buller (*London and New York: Longmans, Green & Co., 1931, vol. 4, pp. XIII+329, pls. 4, figs. 149; 1933, vol. 5, pp. XIII+416, figs. 174; 1934, vol. 6, pp. XII+513, figs. 231*).—These volumes continue the series already reported (E. S. R., 54, p. 46).

Volume 4 deals in part 1 with the *Coprini* and in part 2 with social organization and sex in the Hymenomycetes. Volume 5 discusses in part 1 hyphal fusions and protoplasmic streaming in the higher fungi and in part 2 the production and liberation of spores in certain nonhymenomycetous Basidiomycetes, including stinking smut of wheat (*Tilletia tritici* and *T. laevis*). In volume 6, part 1 deals with the biology and taxonomy of *Pilobolus*, part 2 with the production and liberation of spores in the Discomycetes, and part 3 with pseudorhizae and gemmifers as organs of certain Hymenomycetes.

Mycorrhizae of Wading River region, L. I., L. K. Henry (*Torreya, 34 (1934), No. 5, pp. 111–115, figs. 2*).—Rootlets from 36 different species of trees and shrubs on Long Island, N. Y., were found in all cases to be mycorrhizal. The ectotrophic type of infection predominated. For this type the following are believed to constitute new additions to the list of known hosts: *Betula populifolia, Cephalanthus occidentalis, Quercus ilicifolia, Q. prinoides, Rhus copallina, Salix cordata, S. pentandra, Gaylussacia baccata, Leucothoe racemosa*, and *Lyonia mariana*. Only 7 species possessed the purely endotrophic type, of which the following are considered new records: *Aronia arbutifolia, Amelanchier canadensis, Clethra alnifolia*, and *Vaccinium stamineum*. The histological structure of the mycorrhizae on the newly reported hosts is given in tabular form.

Infection of living plants with dermatophytes [trans. title], E. Nazarova (*Mikrobiologiia, 3 (1934), No. 1, pp. 120–137, figs. 8; Eng. abs., p. 137*).—Tests with *Achorion quinckeanum, Trichophyton gypseum asteroides*, and *Microsporum lanosum*, of animal origin, indicated that under conditions of high humidity, relatively warm temperatures (18°–28° C.), and absence of direct sunlight, these fungi are able to infect plants in a semisaprophytic manner, appearing to possess enzymes which dissolve not only cellulose but the cuticle as well and causing necrosis ahead of hyphal invasion. *A. quinckeanum* appeared to be most highly parasitic, and *Capsella bursa-pastoris* proved most susceptible to it. *Poa* sp., oats, plantain, poplar, and other plants also became infected in these experiments. After passage through plants these fungi did not lose their pathogenicity for animals. It is suggested that in nature dermatophytes may develop on plants and nonliving substrata, as well as upon animals, and pass from one to the other.

A nematosis of Amsinckia caused by a new variety of Anguillulina dipsaci, G. Steiner and C. E. Scott (*Jour. Agr. Res. [U. S.], 49 (1934), No. 12, pp. 1087–1092, figs. 3*).—In this cooperative contribution from the U. S. D. A. Bureau of Plant Industry and the California Experiment Station, fruit galls of *Amsinckia intermedia*, a native California member of the borage family, are described. The causal agent was found to be a new variety of *Anguillulina dispsaci*, the bulb or stem nematode, here called *A. dipsaci amsinckiae* n. v. This form is described, figured, and compared with three other varieties of the species and with the type originally described by J. Kühn (1858) from the teasel. Diagnosis of the new variety is based upon its greater body diameter and the more caudad position of the vulva. Proof is given of the ability of

preadult specimens to revive after remaining dormant and dry for at least 4 yr. and 4 mo.

Erysiphaceae collected in the Jijia River Valley [trans. title], C. V. Oescu and I. M. Rădulescu (*Ann. Sci. Univ. Jassy, 18 (1933), pp. 443–456*).—Sixty-one new hosts of powdery mildews for the country are reported among a total of 137 host species collected.

Peronosporaceae collected in the Jijia River Valley, II [trans. title], C. V. Oescu and I. M. Rădulescu (*Ann. Sci. Univ. Jassy, 18 (1933), pp. 423–442, figs. 9*).—Adding to a list of 52 species of Peronosporaceae on 72 phanerogams already recorded from the District of Iasi (Jassy), Rumania, the author describes 3 new species of *Peronospora*, lists 6 new host species, and reports 33 species belonging to the Peronosporaceae and 66 hosts new to the region.

Physiologic specialization in Puccinia coronata avenae, H. C. Murphy (*U. S. Dept. Agr., Tech. Bul. 433 (1935), pp. 48*).—Detailed results are presented of studies conducted from 1927 to 1932, inclusive, in cooperation with the Iowa Experiment Station. Thirty-three physiologic forms occurring in North America are described, and an analytical key is given for their differentiation.

It was found that physiologic forms differed not only in pathogenicity on oat varieties but also in rapidity of telial development. Certain forms could be subdivided on this basis. Restricted forms tended to develop teliospores more rapidly than aggressive forms. Telia usually appeared on resistant varieties a few days earlier than on susceptible ones.

Fourteen forms were collected from naturally and artificially inoculated *Rhamnus* species. Certain species tended to harbor specific forms. New forms apparently originated by hybridization and segregation on the alternate host. Five additional forms were isolated among aecial collections from species of *Rhamnus* inoculated with form 2. Form 2 is evidently heterozygous.

Victoria, Bond, and Markton varieties were tested at 55°, 65°, 75°, and 85° F. Their reaction to form 1 was not greatly affected by temperature, but at 85° their reaction to form 7 could hardly be distinguished from their reaction to form 1. Certain varieties were resistant at low and susceptible at high temperatures and showed a middle reaction at an intermediate temperature.

The distribution and prevalence of the 33 forms in 1927–32 are reported. Forms 1, 3, and 7 were present each year. Forms 1 and 7, and a number of less important forms, hibernate on fall-sown and volunteer oats in the winter-oat region. Other forms apparently are entirely dependent upon the alternate host for initial dissemination in the spring. Form 7 apparently is dependent upon hibernation for survival. Forms 1 and 7 were the most widely distributed and most commonly prevalent forms.

The seedling reaction of 266 oat varieties to forms 1, 3, 7, 16, 17, and 18 and the adult reaction of these same varieties to natural epiphytotics of crown rust at various locations in the central and southern portions of the United States are presented. Form 1 was the most aggressive of the 6 forms studied, only 4 varieties—Bond, Glabrota, Victoria (C. I. 2401), and Victoria ((Scasco) C. I. 2764)—being resistant to it in the seedling stage. Bond and the two Victorias were the only varieties resistant to all 6 forms.

Certain oat varieties were slightly more resistant to form 1 in the juvenile (fifth- to seventh-leaf stage) than in the seedling (first-leaf stage). Adult plants exhibited a variation in reaction on different portions of an individual plant, usually equal to that found on plants of the same variety in the different stages of development. Whenever differences in reaction on an individual plant were evident, the younger tissues appeared most susceptible and the older

tissues most resistant. This difference, however, with the exception of plants heterozygous for reaction to crown rust, was always meager.

The reaction of 70 gramineous species to 6 forms was characterized by almost uniform immunity or extreme resistance. *Achyrodes aureum*, *Anthoxanthum odoratum*, *Dactylis glomerata*, *Festuca octoflora*, *Phleum pratense*, *Poa annua*, and 14 species of *Avena* developed uredia when inoculated with 1 or more of the 6 forms. There was evidence of slight differential reaction on *Anthoxanthum odoratum*, *D. glomerata*, *F. octoflora*, and *Phleum pratense*.

A cytological study of heterothallism in Puccinia sorghi, R. F. ALLEN (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 12*, *pp. 1047–1068*, *pls. 7*, *figs. 2*).—The results are reported of studies by the U. S. D. A. Bureau of Plant Industry and the California Experiment Station, cooperating, on *P. sorghi*, a full-cycle, heteroecious, heterothallic rust, producing spermogonia and aecia on oxalis and uredia and telia on maize. The haploid mycelium on oxalis is composed of uninucleate cells. It produces spermogonia and small aecial primordia. In the absence of fertilization the aecia fail to mature and soon die. When spermatia are transferred from one infection to the surface of another infection of opposite sex, fertilization takes place.

If a spermatium is by chance in contact with a paraphysis of a spermogonium, it becomes attached to it. The spermatial nucleus moves over into the paraphysis and down through it into the mycelium inside the leaf. Under favorable conditions, a spermatium not in contact with a surface hypha can germinate and grow in through a stoma and there connect with internal mycelium.

Spermatial nuclei that have entered the haploid mycelium multiply rapidly and become distributed throughout the mycelium. Twenty-four hr. after "spermatization" 60 percent of the mycelial cells contain more than one nucleus. Fresh aecial primordia also become diploidized and mature rapidly, and all aecia formed thereafter develop normally. One fertilization suffices for the lifetime of the infection.

Australian rust studies.—IV, Natural infection of barberries by black stem rust in Australia, W. L. WATERHOUSE (*Linn. Soc. N. S. Wales, Proc.*, *59* (*1934*), *pt. 1–2*, *pp. 16–18*, *pl. 1*).—Continuing earlier studies (E. S. R., 68, p. 342), *Puccinia graminis tritici* 34 was found on barberries at Yetholme, New South Wales, in December 1933. The same form was present on *Agropyron scabrum* associated with the barberries.

Studies on the possible origin of physiologic forms of Sphacelotheca sorghi and S. cruenta, H. A. RODENHISER (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 12*, *pp. 1069–1086*, *pl. 1*, *figs. 8*).—Studies were made of the segregates of intraspecific and interspecific hybrids of the kernel smuts of sorghum, *S. sorghi* and *S. cruenta*. The data obtained indicate that physiologic forms of *S. sorghi* and *S. cruenta* may develop as a result of hybridization. Fusions readily occurred between uninucleate sporidia of pathogenically distinct strains of *S. sorghi* and between sporidia of *S. sorghi* and *S. cruenta*, thus initiating the formation of diploid hyphae containing hereditary factors of two parental lines.

Factors governing the sex of sporidia, the general morphology of the smut sori, the color of peridia, and the degree to which host plants may be stunted were inherited independently of each other. On Reed kafir (C. I. 628) the intraspecific crosses were more virulent than were inbred lines of either parental form. Interspecific hybrids were less virulent on this variety than were the inbred parent lines. In general, on varieties of sorghum susceptible to one parent and resistant to the other, both intraspecific and interspecific hybrids were intermediate in their virulence.

Possibilities in plant virus classification, L. O. KUNKEL (*Bot. Rev., 1 (1935), No. 1, pp. 1–17*).—Recent developments in methods of differentiating and classifying plant viruses are discussed. The newer discoveries regarding the relationships of different viruses to each other, as disclosed by serological and immunological tests and by vector relationships, are presented. A bibliography is given.

The rusts of cereal crops, H. B. HUMPHREY, E. C. STAKMAN, E. B. MAINS, C. O. JOHNSTON, H. C. MURPHY, and W. M. BEVER (*U. S. Dept. Agr. Circ. 341 (1935), pp. 27, figs. 10*).—This is a carefully prepared statement for the benefit of growers and students regarding the characteristics, the host range, the life history, the epidemiology, the distribution and economic importance, and the latest practical methods of control, including cultural practices, eradication of alternate hosts, the use of resistant varieties, and protection by sulfur dusting where practicable. The rusts here considered are as follows: Wheat—stem rust (*Puccinia graminis tritici*), leaf rust (*P. triticina*), and stripe rust (*P. glumarum*); oats—stem rust (*P. graminis avenae*) and crown rust (*P. coronata*); barley—stem rust (*P. graminis tritici*) and leaf rust (*P. anomala*); rye—stem rust (*P. graminis secalis*) and leaf rust (*P. dispersa*); corn—corn rust (*P. sorghi*); and sorghum—sorghum rust (*P. purpurea*).

Existing knowledge regarding distinct parasitic strains or physiologic forms is compactly summarized.

Correlated inheritance in oats of reaction to diseases and other characters, D. C. SMITH (*Minnesota Sta. Tech. Bul. 102 (1934), pp. 38, figs. 4*).—Progenies of crosses of the oat varieties Gopher and Rainbow, the former susceptible and the latter resistant to *Puccinia graminis avenae*, were studied in the F_2 and F_3 generations. Stem rust resistance was inherited as a dominant character, and a single-factor pair appears active in its determination. The resistance of Rainbow to physiologic forms 1, 2, 3, 5, and 7 was dominant in the progeny. The results obtained for segregation to forms 8 and 9 were inconclusive regarding the manner of inheritance, though the data indicate that the same factor pair influences the reaction to these forms. No families resistant to form 4 or form 6 were obtained. Seedling and adult plant reactions to forms 1, 2, 3, 5, and 7 were in complete agreement. The probable existence of a series of multiple allelomorphs controlling reaction to *P. graminis avenae* is indicated.

Stem rust resistance was inherited independently of lemma color, awn length, strength or presence, basal hairs, blast, culm diameter, or breaking strength of straw. The use of the breaking strength test as a means of distinguishing plants having an inheritable advantage in this respect appeared unjustified. Other factors than culm diameter and breaking strength were found important in the distinction of strains resistant to lodging. Percentage of blast in F_3 families was significantly correlated in a positive manner with lateness of heading.

Resistance of F_1 plants to crown rust (*P. coronata*) was dominant or intermediate in the seedling stage and intermediate in the adult plants in four crosses observed. Segregation in the F_2 generation of crosses of Victoria with Double Cross II–22–220, Minrus, and Anthony indicated that early-maturing types resistant to crown rust could be obtained from these crosses. The small number of completely susceptible families in F_3, in crosses of Victoria with Double Cross and Anthony, indicated that more than a single factor is involved or that susceptible types were eliminated due to some type of sterility. Crown rust resistance was associated to some extent with lateness of maturity in progenies of Victoria × D. C. II–22–220. This relation was less marked or absent in crosses of Minrus and Anthony with Victoria.

Influence of smut infection on plant vigor and other characters in smut-resistant oat varieties, V. C. Hubbard and T. R. Stanton (*Jour. Agr. Res. [U. S.], 49 (1934), No. 10, pp. 903–908*).—A 3-yr. test at Mandan, N. Dak., showed that the smut-resistant oat varieties Black Mesdag, Markton, and Navarro grown from inoculated hulled seed were adversely affected by the presence of the smut *Ustilago levis*, even though none became visible in the growing plants. The yield per row, the number of plants, panicles, and culms per row, and the height of plants in resistant varieties, as well as in the susceptible control variety Victory, were reduced by smut infection. Yield reduction was, perhaps, due chiefly to the reduced number of surviving plants in the inoculated rows and to the presence of nonsporulating infection. Smut infection tended to retard the first heading.

Early, medium, and late seedings were made in each of the 3 yr. the experiment was conducted. The average yields of the early and medium seedings were greater than those of the late seedings, and in every case the average yield of the noninoculated rows was greater than that of the inoculated rows, indicating, perhaps, that nonsporulating infection reached its greatest development in the late seedings. The rate of plant mortality increased progressively with the later dates of seeding.

Wheat-bunt investigations in Wyoming, G. H. Starr (*Jour. Colo.-Wyo. Acad. Sci., 1 (1934), No. 6, pp. 55, 56*).—This is an abstract of a contribution from the Wyoming Experiment Station presented at the seventh annual meeting of the Colorado-Wyoming Academy of Science at Laramie in 1933.

Relation of leaf-rust infection to yield, growth, and water economy of two varieties of wheat, C. O. Johnston and E. C. Miller (*Jour. Agr. Res. [U. S.], 49 (1934), No. 11, pp. 955–981, figs. 7*).—Plants of two spring wheat varieties, Pusa No. 4 (susceptible) and Warden (resistant), were grown in 1-gal. stone jars in the greenhouse at the Kansas Experiment Station, and groups of each were inoculated with leaf rust (*Puccinia triticina*) in the seedling, jointing, budding, and flowering stages of growth.

The reductions in grain yield caused by leaf rust on Pusa No. 4 were proportionate to the earliness of the infection period, ranging from 93.8 percent when inoculations were made in the seedling stage to 42.4 percent when they were made in the flowering stage. Severe flecking on the resistant Warden produced a maximum reduction of 15.2 percent. In the susceptible variety the yield of straw was also reduced, but less extensively than the grain yield.

Prolonged heavy leaf rust infection on the susceptible variety caused deterioration of the root systems, reduced the number of heads and kernels, depressed the plant height, and increased the time required to head and to mature. Such responses in the resistant variety were usually slight and often negligible.

The water requirement of the susceptible variety was increased by rust from 31.7 to 104 percent, on the basis of total dry matter, depending on the duration of the infection. Heavy flecking on the resistant variety increased the water requirement only slightly.

Lodicules and wheat breeding for loose smut resistance, A. Tavčar (*Lodicules et culture de froment résistant au charbon. In 16. Congres International d'Agriculture, Budapest, 1934. Rapports Spéciaux. Budapest: Min. Agr. [1934], Sect. 4, Thème 2, pp. 1–9*).—Studies of natural infection by *Ustilago tritici* in pure lines of the two winter wheat varieties most extensively grown in Yugoslavia, Prolific and du Banat, showed about seven times as much smut in the former as in the latter. Examination of the flowering spikelets showed that the lodicules were larger, that the glumes opened to an angle 9.58° wider, and that they remained open 3 min. longer, on the average, in Prolific than

in du Banat. This probably accounts for the difference in natural infection, since artificial inoculations revealed no difference in average susceptibility between them. It is held that the size of lodicules is, therefore, of some importance in the development of wheat varieties resistant to loose smut.

Effect on wheat plants of Ophiobolus graminis at different levels in the soil, H. FELLOWS and C. H. FICKE (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 10*, *pp. 871–880, figs. 5*).—In investigations conducted cooperatively by the U. S. D. A. Bureau of Plant Industry and the Kansas Experiment Station, susceptible wheat plants were grown in pots in the greenhouse in soil taken from different successive depths in take-all infested fields near the station to determine the presence or absence of *O. graminis*. The fungus was found to occur all through the upper layers down to a depth of 15 in.

By means of layers of inoculum consisting of naturally infested soil or of artificial cultures, placed at different levels in uninfested soil, it was found that serious injury to wheat plants resulted only when the fungus was placed 3 in. or less from the seed.

Injury resulted from the invasion of the crown, which was penetrated through the primary roots, secondary roots, or subcrown internode. Wheat plants having but few roots attacked survived, put out additional roots, and apparently functioned normally. The invasion of a large number of roots, however, produced a severely infected crown and resulted in death or in a badly damaged wheat plant.

The fungus advanced in the roots farther upward than downward.

Seed treatment, W. E. BRENTZEL (*North Dakota Sta. Circ. 56* (*1935*), *pp. 16*, *figs. 7*).—This is a popular discussion of the use of New Improved Ceresan, copper carbonate, formaldehyde, and hot water for control of the various smut diseases, seedling blights, stripe, and scab of cereals, including wheat, oats, barley, emmer, and millet.

Handbook of diseases of new bast fiber plants, L. GITMAN and E. BOĬCHENKO (*Spravochnik po bolezn͡iam novykh lub͡ianykh kul'tur. Moskva* (*Moscow*): *Vsesoi͡uzn. Akad. Selsk. Khoz. Nauk Lenina, Inst. Nov. Lub. Syr.*, *1934*, *pp. 98+* [*26*], *figs. 86; Eng. abs., pp. 32, 33*).—This manual was prepared by the division of plant protection of the New Bast Fiber Institute in Moskva to facilitate the identification of diseases of fiber plants belonging to the genera *Abutilon*, *Cannabis*, *Hibiscus*, *Apocynum*, *Boehmeria*, and *Asclepias*.

Histological studies of a seedling disease of corn caused by Gibberella moniliformis, R. K. VOORHEES (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 11*, *pp. 1009–1015*, *pls. 10*).—In studies at the Florida Experiment Station, both artificially and naturally infected seedlings were used. The fungus was found to penetrate the coleoptile and mesocotyl directly and to enter the plumule where it breaks through the apex of the coleoptile. It grew rapidly in the spaces between the leaves, finally penetrating the leaves and destroying the cells.

Invasions of the mesocotyl resulted from direct penetration of the epidermis and through ruptures in the cortex produced by the emergence of adventitious roots. The fungus was found able to enter the cotyledonary plate region through the natural opening produced by the stem bud breaking through the pericarp and thence advance into the storage tissues. It could, however, invade these tissues by entering through the rupture produced by the emergence of the coleorhiza. The fungus was found able also to enter the primary radicle directly through the epidermis, but it usually entered through ruptures produced in the cortex by the emergence of lateral roots.

The endodermis surrounding the steles in the mesocotyl and primary radicle formed a barrier against penetration, its effectiveness depending upon the degree

of suberization. The steles of the mesocotyl and primary radicle were easily invaded, however, through the adventitious and lateral roots, respectively.

Catalase activity in relation to age and viability of sclerotia of the cotton root-rot fungus, C. J. KING, E. D. EATON, and C. HOPE (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 10, pp. 897–902, fig. 1*).—The sclerotia of the cotton root rot fungus, *Phymatotrichum omnivorum*, darken as they grow older, but the color has not been found altogether reliable as an indication of their age nor to be a good indicator of vigor. Catalase activity was therefore investigated.

It was found that as a rule the catalase activity of the macerated tissues of the sclerotia declined with age, but that no great or abrupt reduction in activity occurred until the sclerotia began to lose germinative power. An unusually high catalase activity found in samples 5–8 weeks old suggested an "afterripening" process comparable to that occurring in certain seeds, during which the catalase activity reaches its maximum. Catalase activity seemed to parallel closely the metabolic condition of sclerotial tissues and might, therefore, be used as an indicator of their age and as a test for full vigor, declining vigor, or death.

Catalase activity was found to be reduced about one-half when the sclerotia were air-dried for 1 hr.

Some microbiological activities affected in manurial control of cotton root rot, C. J. KING, C. HOPE, and E. D. EATON (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 12, pp. 1093–1107, figs. 5*).—Organic manures (alfalfa hay and corral manure) applied in deep furrows were effective in controlling cotton root rot in Arizona field experiments conducted since 1921. In 1933 the average number of cotton plants killed in ¼-acre untreated plats was 1,434, and in alternate manured plats 106.

Special apparatus was devised for determination of the CO_2 evolved from large cylindrical cores of soil obtained from adjacent manured and untreated plats. The rate of CO_2 evolution from the soil of manured plats ranged from 19 to 152 percent greater than from unmanured plats, indicating a greater microfloral activity as a result of increasing the organic matter in the soil.

The relative abundance of soil organisms in manured and unmanured plats was measured by a modification of the method of N. Cholodny, referred to in the following abstract, which involves direct microscopic examination of organisms collected on microscope slides exposed for several days in the soil. Bacteria, actinomycetes, and most fungi were more abundant on slides exposed in the manured plats. The root rot fungus (*Phymatotrichum omnivorum*) was more abundant on slides from untreated plats. The reduction of root rot activity in the manured areas suggests that the dense population of organisms engaged in decomposing the organic materials developed a condition unfavorable for the growth of the root rot fungus.

A study of the cotton root-rot fungus (Phymatotrichum omnivorum) in the soil by the Cholodny method, E. D. EATON and C. J. KING (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 12, pp. 1109–1113, figs. 3*).—A modification of the microslide method of N. Cholodny was used in a study of the cotton root rot fungus (*P. omnivorum*) and associate organisms under natural soil conditions. Root rot mycelium developed on slides inserted in the soil of a cotton plat in the spring at least 6 weeks before the first disease symptoms appeared on nearby cotton plants. It also developed on slides exposed in clean fallow areas. Use of the technic is suggested in studies of the root rot fungus that involve control, detection of the fungus in fallow areas, and its interrelations with other organisms.

Specially treated wooden stakes with a slide-holding device were used for exposing the slides at different depths in the soil.

The quality of lint and seed from cotton plants with Phymatotrichum root rot, J. J. TAUBENHAUS and W. N. EZEKIEL (*Phytopathology, 25 (1935), No. 1, pp. 104–113*).—In this study at the Texas Experiment Station, root rot was found to have a definite, bad effect on the quality of lint and seed directly proportional to the earliness of attack, but the loss from reduction in quality was found much less important than the loss from reduction in yield due to root rot.

Some effects of Phymatotrichum root rot on the microscopic characters of cotton fibers, G. N. STROMAN, J. J. TAUBENHAUS, and W. N. EZEKIEL (*Phytopathology, 25 (1935), No. 1, pp. 126–130*).—This study at the Texas Experiment Station showed that fibers from plants killed early in the season were wider and thicker and had a smaller number of convolutions per unit length than fibers from normal plants. Such abnormal fibers constituted only a relatively small percentage of the crop from affected fields under dry farming conditions. Fibers from plants killed later in the season were not significantly different from those from the normal plants.

Observations and investigations on the rust spot disease of the potato [trans. title], K. MEYER-HERMANN (*Fortschr. Landw., 8 (1933), No. 9, pp. 200–205, fig. 1*).—This trouble, which is held different from cork formation, is described. Studies indicate that it is attributable to the effect of soil and climatic factors and not transmissible through the seed tubers.

The geographic distribution of potato wart (Synchytrium endobioticum) [trans. title], E. LEPIK (*Agronoomia, 14 (1934), No. 7, pp. 270–273, figs. 3*).—A summary and map of the present known distribution in Europe is given for this disease, which has not thus far been found in Estonia. The direction of spread from various centers to other parts of the world is indicated diagrammatically on the map.

Pythium scleroteichum n. sp. causing mottle necrosis of sweetpotatoes, C. DRECHSLER (*Jour. Agr. Res. [U. S.], 49 (1934), No. 10, pp. 881–890, figs. 2*).—A fungus designated earlier as *P. scleroteichum* (E. S. R., 57, p. 648) is here described under that binomial as a new species. It has been found in Delaware, Maryland, Virginia, Ohio, and Iowa, attacking the large edible roots of the sweetpotato, causing an extensive, peculiarly labyrinthine, cheesy or felty decay, entirely similar to the decay caused by *P. ultimum* and similarly designated as mottle necrosis. Less frequently it has been obtained from decaying rootlets attached to infected parts of the edible roots.

In pure culture it forms little or no aerial mycelium. Oogonia are produced in large numbers on many substrata, often only to undergo wholesale internal degeneration. On certain media, however, like acidulated maize meal suspension agar, normal sex apparatus is formed in large quantity. The oogonium, with an average diameter of 23.8μ, is provided with a thick, unusually sturdy wall. It is fertilized by 1 to 5 relatively small, frail looking, upcurved, crook-necked antheridia, borne terminally on longish ramifying branches that enwrap the oogonium intimately and extensively in a manner suggestive of various species of *Aphanomyces*. The mature oospore, with an average diameter of 18.7μ, has a relatively thin wall and a characteristic yellowish coloration. The species is considered most closely related to *P. perilum*. A Latin diagnosis is given.

Leaf spots [of tobacco in Connecticut], P. J. ANDERSON (*Connecticut [New Haven] Sta. Bul. 367 (1935), pp. 117–135, figs. 9*).—The author discusses the symptoms and occurrence in Connecticut of the various types of tobacco leaf spots found there, including those produced by wildfire (*Bacterium tabacum*), by angular leaf spot or blackfire (*B. angulatum*), by the ring spot virus, and by

the mosaic virus (known as "rust" or fleck), as well as those of probable nonparasitic or physiological origin known as the John Williams Broadleaf spot, and the brown leaf spot and white speck, with which *Alternaria tenuis* (*Pleospora alternariae*) appeared to be saprophytically associated.

Transmissibility by aphids of the tobacco mosaic virus from different hosts, I. A. HOGGAN (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 12, pp. 1135–1142*).—In continuation of cooperative work by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station, already referred to (E. S. R., 65, p. 247), 3 species of aphids (*Myzus pseudosolani, M. persicae*, and *Macrosiphum solanifolii*) were tested repeatedly in large numbers for their ability to transmit the ordinary tobacco mosaic virus from 18 different host plants, including several perennial weed hosts of tobacco mosaic and various susceptible nonsolanaceous plant species. Transmission of tobacco mosaic was obtained with regularity only from tomato (*Lycopersicum esculentum* and *L. pimpinellifolium*). Occasional infections developed in trials with 8 other hosts, and none with the remaining 8 species tested.

In general, the highest percentage of transmission from any host was obtained with *Myzus pseudosolani*, less with *Macrosiphum solanifolii*, and least with *Myzus persicae*. Transfers of aphids from *L. pimpinellifolium*, affected with tobacco mosaic, to the hybrid *Nicotiana tabacum* × *N. glutinosa* demonstrated that, with *M. pseudosolani*, about 1 aphid in 129 was able to cause infection; with *Macrosiphum solanifolii*, about 1 aphid in 140; and with *Myzus persicae*, about 1 aphid in 800 or more, whereas in the transmission of a crucifer mosaic virus and of the sugar beet mosaic virus by *M. persicae*, about 1 aphid in 4 or 5 was shown to be infective, and a high percentage of transmission of cucumber mosaic was obtained with all 3 species of aphids.

It is concluded that aphids are not likely to be responsible for any significant amount of dissemination of ordinary tobacco mosaic to tobacco fields.

Colletotrichum truncatum (Schw.), n. comb., on garden and lima beans, C. F. ANDRUS and W. D. MOORE (*Phytopathology, 25* (*1935*), *No. 1, pp. 121–125, figs. 2*).—*C. truncatum*, first described as *Vermicularia truncata* (1832) and as *V. polytricha* (1883) and *C. caulicolum* (1911), is reported as coming into prominence as a cause of serious injury to lima beans (*Phaseolus lunatus*) in the southern and eastern United States. Artificial inoculations demonstrated its pathogenicity on varieties of *P. lunatus* and *P. vulgaris*. The morphology, synonymy, and symptoms produced by the fungus on both hosts are discussed. The Latin diagnosis gives the conidial measurements as 18–30×3–4μ.

Fusarium-resistant Danish Ballhead cabbage, J. C. WALKER and L. M. BLANK (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 11, pp. 983–989, fig. 1*).—In work by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station from 1927 to 1933, selections were made from Danish Ballhead cabbage grown on soil infested with the yellows organism *F. conglutinans*. Progenies were secured from seed produced by self-pollination, sib crosses, and backcrosses with plants of a homozygous susceptible line. The reaction of such progenies on infested soil demonstrated that the main gene for *Fusarium* resistance, as previously described (E. S. R., 63, p. 344), was involved.

Certain of the homozygous resistant progenies were allowed to cross-pollinate naturally, and the resulting progeny was compared with Danish Ballhead strains and Wisconsin Hollander as to type characters. The resistant strain, Wisconsin Ballhead, was similar to the susceptible Danish Ballhead strains in type and maturity and was distinctly earlier than Wisconsin Hollander.

Control of Septoria leaf spot of celery: Several years' spraying investigations with copper sprays [trans. title], E. ELSSMANN (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 44 (1934), Nos. 4, pp. 192–205, fig. 1; 5, pp. 209–222*).—Three years' experiments with 1 percent bordeaux spray and with a proprietary bordeaux mixture increased yields in all of the plats that were repeatedly sprayed against *S. apii*. The results varied with the season and with the number of sprayings, the increase ranging from 16.2 to 114.8 percent, with a net gain in value ranging from 22.3 to 103.2 percent. The proprietary preparation, although effective, proved slightly inferior to the bordeaux mixture. From 3 to 4 sprayings are held sufficient for the greatest yields consistent with utmost economy.

Control of tomato seedbed diseases of southern plants, F. VAN HALTERN (*Georgia Sta. Bul. 187 (1935), pp. 39*).—In this bulletin the results of 4 yr. of experimental work (1931–34) on methods of producing disease-free tomato plants are presented for the benefit of growers in Georgia, where on over 2,200 acres some 150,000,000 plants were raised in 1934 for the northern tomato-producing States. The principal diseases involved and their means of spread are first discussed. These are *Macrosporium* blight (*M. solani* and *M. tomato*), bacterial canker (*Aplanobacter michiganense*), bacterial spot (*Bacterium vesicatorium*), *Fusarium* wilt (*F. lycopersici*), brown rot (*B. solanacearum*), and *Septoria* blight [*S. lycopersici*].

Based on the results of the tests reported, the author suggests that the growers use seed from healthy plants or certified seed, treating it in a 1–3,000 $HgCl_2$ solution for 5 min., and that the plants be sprayed with a 2–3–50 bordeaux mixture when the second rough leaves are starting, followed by bordeaux mixture 3–4–50 at about 2-week intervals.

The seed, which was produced in intensive market sections in the North, appeared to be the carrier and principal source of most of the diseases found on southern plants. The usual April–May drought was found to be a factor aiding in the control of plant-bed diseases. The fungus causing *Macrosporium* blight was found to winter over in the soil.

Disease-free seed planted in soil where tomatoes had not grown previously produced plants free from blight, while some of the same seed in soil that grew plants the year before produced blighted plants. In two tests bacterial canker did not winter over in south Georgia soil. Bordeaux mixture sometimes burned the foliage of plants when young or when sappy and rank-growing, but the presence of bordeaux spray on the plants was of little importance as a cause of excessive wilting of newly set plants. Seed treatment proved more valuable for disease control than spraying. Sanitary measures to aid in disease control are suggested.

Studies on apple scab and spray materials for its control in the Hudson Valley, J. M. HAMILTON (*New York State Sta. Tech. Bul. 227 (1935), pp. 56, figs. 18*).—The results are reported of a 3-yr. investigation (1932–34) continuing studies already noted (E. S. R., 67, p. 143). Charts are presented depicting the relations of prevailing temperatures, humidity, and precipitation through each of the three growing seasons to the development and discharge of ascospores, the duration of infection periods, scab incubation periods, and the dates of experimental spray applications.

Seventeen different spray and dust materials were tested, and the results in scab control and fungicidal injury under Hudson Valley conditions are discussed for each. The adhesive qualities of sulfur sprays and dusts and the influence of rainfall on the deposit were determined by uniform sampling with the use of carbon tetrachloride for the extraction of the sulfur. The results are presented

in graphic form. Studies on the effect of spraying in bloom and on the adhesiveness of arsenicals combined with various fungicides are also reported.

It was found that in the Hudson Valley ascospores of *Venturia inaequalis* may be discharged through a period extending at least from the time the first leaf tips show (mid-April) until terminal growth is complete (late June). The infection waves and hence the best application dates varied chiefly with the occurrence of wetting periods and the abundance of spore dissemination. In these tests the most important applications proved to be the pink, calyx, 10-day, and mid-June sprays.

Lime-sulfur and, to a lesser extent, dry lime-sulfur were found to eradicate scab infections, as well as to protect against new infections, while the other materials tried were protective only. Liquid lime-sulfur 1–60, thoroughly applied, gave good scab control under Hudson Valley conditions. Arsenate of lead materially increased the effectiveness of lime-sulfur when applied after infection periods, unlike the other insecticides tried.

Wettable sulfurs gave satisfactory scab control when properly timed. Their use, particularly after petal fall, proved to be a desirable modification of the lime-sulfur program, but it was found that poorly-timed applications of wettable sulfurs may result in considerable scab. Hydrated lime sometimes decreased the adhesiveness of wettable sulfurs sufficiently to lower their effectiveness. One lb. used for each pound of lead arsenate in the spray appeared sufficient. Of the wettable sulfurs tested, dry mix, Magnetic-Spray, and Koppers flotation sulfur proved to be the most satisfactory to use with calcium arsenate, but to avoid danger of defoliation and fruit drop 3 lb. of lime were required for each pound of calcium arsenate.

It was found that sulfur dusts may be used satisfactorily in good orchard practice for scab control, but they are considered mainly as a supplementary or emergency measure.

Wettable sulfurs and sulfur dusts were found to leave more residue or less residue, depending on the degree of adhesiveness and the amount applied, which was largely determined by the fineness or lightness of the sulfur used, but dusts containing bentonite gave indication of value for application during drizzly rain or on still wet foliage. It is concluded that to obtain as good scab control, wettable sulfurs and sulfur dust must be applied more frequently than lime-sulfur spray.

Coposil, one of the most satisfactory substitutes for bordeaux mixture, appeared to give commercial control of scab. It required about 6 lb. of hydrated lime to 100 gal. of the spray. Copper phosphate (with lime and bentonite) gave indication of being as good as, or better than, Coposil in more limited trials. There was considerable varietal difference as to when the first application of a copper spray could safely be made. Observations indicated that, in general, with the possible exception of McIntosh, it could not be applied safely until at least a month after petal fall. The bordeaux mixture substitutes proved inferior as to sticking properties.

Calcium arsenate proved injurious when combined with lime-sulfur, except with the vigorous trees of McIntosh.

In the adhesiveness tests with sulfur sprays and dusts, it was found that the amount of sulfur removed from fruit or foliage by the first rain depended on the character of the spray and coarseness of the particles. After the first rain the rate of loss did not vary greatly, the amount adhering being proportionate, in general, to the amount of fine sulfur present. Less sulfur remained after the first rain on foliage dusted when dry than on foliage sprayed with a wettable sulfur and allowed to dry. Adhesiveness was found influenced by the variety of apple.

The study of spray residue showed that applications of lime-sulfur and lead arsenate on Baldwin made June 29 were not reduced below the legal tolerance on September 28 by 26 rains delivering 19 in. of total precipitation. Lime-sulfur with calcium arsenate was reduced to an equivalent point after only 12 rains delivering about 6 in. Approximately the same, or less, residue remained from the wettable sulfurs with calcium arsenate. The amount of arsenic remaining, however, was not necessarily proportionate to the amount of sulfur left from any wettable sulfur. It differed with the kind used. Arsenical residue was reduced below tolerance on a dusted block by a shower of 0.14 in.

In the studies on the relation of spraying and dusting to fruit setting, although sulfur was found toxic to pollen, 1 or, at most, 2 days of favorable pollinating conditions proved enough to permit good fruit setting, even though the trees were subsequently sprayed in full bloom.

Early season spraying practices as related to scab control and spray injury, W. C. Dutton (*Ohio State Hort. Soc. Proc., 67 (1934), pp. 63–66*).—This contribution from the Michigan Experiment Station states that it has been found that the best control of apple scab (*Venturia inaequalis*) was obtained by thorough and continuous coverage during the preblossom period. The least foliage injury also was usually found to occur before bloom, hence emphasis is laid on thorough work early in the season. For the benefit of the grower, the comparative results obtained with different sulfur fungicides are discussed.

The raspberry white-bud disease and its relation to bitter rot of apples, K. J. Kadow (*Phytopathology, 25 (1935), No. 1, pp. 91–103, figs. 5*).—According to this contribution from the University of Illinois, many red raspberry varieties in that State were seriously attacked in 1932 and 1933 by a *Glomerella* greatly resembling the apple bitter rot fungus *G. cingulata*. Cultural, morphologic, and pathogenic characteristics, however, showed the causal organism to be *G. rubicola*, a fungus already reported from Canada and New Jersey. Under field conditions it is held easily confused with raspberry spur blight, *Didymella applanata*.

"Short joints" (court-noué) [trans. title], G. Bénes (*Prog. Agr. et Vitic., 51 (1934), No. 16, pp. 371–374*).—The author presents observations on this disease and its effects, discusses recent ideas regarding its etiology, and expresses the belief that it is soil borne and capable of amelioration through the application of lime to the soil.

Curative action and adhesiveness of certain cupro-ammoniacal spray mixtures [trans. title], M. Bosc (*Prog. Agr. et Vitic., 50 (1933), No. 48, pp. 532–534*).—Tests of a colloidal spray consisting of copper sulfate 2–3 kg, carbonate of soda 2–3 kg, and ammonium sulfate 1–1.5 kg to 100 l of water gave good results in combating downy mildew of grape (*Plasmopara viticola*) from 1930 to 1933. The treatment was satisfactory from the standpoint of adhesiveness, fungicidal efficiency, and freedom from spray injury. The wetting property of the spray was best with the 3 kg formula.—(*Courtesy Biol. Abs.*)

Avocado diseases in California, W. T. Horne (*California Sta. Bul. 585 (1934), pp. 72, figs. 34*).—The principal results of studies by the author in Cuba, at the California Experiment Station, and at the California Citrus Experiment Station are brought together. For each type of disease or injury the symptoms, the nature of the causal agencies, the epidemiology, and the known means of prevention or control are discussed as far as possible.

The diseases covered include sun blotch (graft-transmitted, probably of virus origin), tipburn (physiologic, due perhaps to unbalanced water relations or excess salts), mottle-leaf or little leaf, also called foliocellosis or frenching (nutritional disorder), chlorosis (probably due to unavailable iron), smudgy

spot (*Helminthosporium* sp.), anthracnose or withertip (*Colletotrichum gloeosporioides*), burn, desiccation, or sunburn (excessive water loss and heat), frost or cold injury (varietal resistance to cold, influence of tree condition on cold resistance, and prevention and treatment of cold injury are discussed), cankers (*Phytophthora cactorum* and others), dying twigs and branches (due mostly to shading out), witches'-broom and unusual structures (nonparasitic), rough bark of trunks (cause uncertain), melanorhiza or water injury (due to poor soil drainage), asphyxiation, apoplexy, or collapse (due probably to rapidly-developed deficiency of oxygen in the soil), oak root fungus (*Armillaria mellea*), abscission of flowers and fruits (nonparasitic), carapace spot (corky blemish of probable mechanical origin), Thompson spot (on fruit of the Thompson variety, probably physiologic), blast or citrus blast (*Bacterium syringae*), crick-side of fruit (physiologic, cause unknown), embossment of fruit (cause unknown), ring-neck of fruit pedicels (cause unknown), end-spots on fruit (due to overmaturity or desiccation), hollow fruit (cause undetermined, probably nonparasitic), sunburn of fruit, senility or old age of fruit, lenticel cork on fruit (cause undetermined), *Rhizopus* rot (*R. nigricans*), *Dothiorella* rot or surface rot (*Botryosphaeria ribis chromogena*), anthracnose rot (*C. gloeosporioides*), miscellaneous fruit decays (various fungi), and flesh darkening (cause undetermined).

The temperature relations of harvested fruit are also discussed.

Sphaceloma perseae the cause of avocado scab, A. E. Jenkins (*Jour. Agr. Res.* [*U. S.*], *49* (*1934*), *No. 10, pp. 859–869, pls. 4*).—The results are given of a field and laboratory study of *S. perseae*, the cause of scab of avocado (*Persea americana*), which show it is culturally and morphologically distinct from *S. fawcettii*, the cause of citrus scab, with which it was formerly thought to be identical. The original description of *S. perseae* has already been referred to (E. S. R., 70, p. 799).

In parallel inoculation experiments with the two organisms, infection was obtained on citrus only with *S. fawcettii* and on avocado only with *S. perseae*. The avocado varieties found affected in Florida are Fuerte and Lulu, Mexican-Guatemalan hybrids; Trapp, of the West Indian race; and Taylor, Challenge, Perfecto, and Surprise, of the Guatemalan race. The geographic range includes Florida, Cuba, Puerto Rico, Haiti, Mexico, Peru, Brazil, and the Union of South Africa.

A colored plate illustrates the appearance of the disease on leaves, fruit, and the young stem.

Experiments on the control of the root-knot nematode in the field with chloropicrin and other chemicals, G. H. Godfrey (*Phytopathology, 25* (*1935*), *No. 1, pp. 67–90, figs. 4*).—Two field experiments on the control of *Heterodera marioni* in heavily infested Hawaiian pineapple fields, incorporating the use of chloropicrin and certain other chemicals, were conducted in 1931 and 1932, using the Latin square arrangement of plats. Treated beds were immediately covered with tar-impregnated pineapple mulching paper. Gall counts were made on the roots of cowpeas used as indicator plants and also on sample pineapple plants. The yields were recorded.

Although marked benefit resulted in the first test in spite of imperfect gas confinement, in the second experiment the reduction in nematode count and increase in yield were striking. In this case, chloropicrin applied at the rates of 150 lb. and 170 lb. per acre lowered the nematode population by 83 and 90 percent, respectively, and increased the yield by over 52 percent in each case as compared with the controls. Carbon bisulfide used at the rate of 750 lb. per acre resulted in only about half as great nematode reduction and yield in-

crease as the chloropicrin. Substantial profits from the use of the latter are indicated in cases of badly infected soils.

Bacterial leaf spot of carnations, W. H. BURKHOLDER and C. E. F. GUTERMAN (*Phytopathology, 25 (1935), No. 1, pp. 114–120, figs. 2*).—In this contribution from the [New York] Cornell Experiment Station, the bacterial leaf spot of carnation and its causal agent (*Phytomonas woodsii*) are described, and the results of cultural studies are summarized. The variety Sophelia was found very susceptible. Spectrum Supreme, Salmon Spectrum, Potentate, and Patrician were found moderately susceptible. The observations of others regarding varietal susceptibility are given.

Tests indicated the inability of the organism to infect without wounds such as those produced by mites or other agencies. The optimum temperature for the development of lesions was found to be 75° F. Control of mites and maintenance of sanitation and reasonably low temperature and humidity in the greenhouse are advised.

A virous disease of perennial delphiniums, F. D. HEALD and G. BURNETT (*Bul. Amer. Delphinium Soc., 2 (1934), No. 2, pp. 14–21, figs. 5*).—This contribution from the Washington Experiment Station is, to a considerable extent, a condensation of Burnett's report on Delphinium "stunt" already referred to (E. S. R., 71, p. 804).

Experimentally reproduced fungus diseases of paper [trans. title], A. and R. SARTORY, J. MEYER, and H. BÄUMLI (*Compt. Rend. Acad. Sci. [Paris], 199 (1934), No. 3, pp. 222–224*).—Macroscopic and microscopic studies of the slow cellulolytic action of molds isolated from mold-spotted paper were made on sterilized paper. Degradation by *Aspergillus*, *Fusarium*, and *Cladosporium* is attributed to endoenzymes in the filaments. It was arrested by inhibition products. *Actinomyces* and *Monilia* attacked the paper progressively by means of exoenzymes from their spores, producing no discoloration.—(*Courtesy Biol. Abs.*)

ECONOMIC ZOOLOGY—ENTOMOLOGY

Transactions of the Twentieth American Game Conference (*Amer. Game Conf. Trans., 20 (1934), pp. VI+361, pls. 2, figs. 9*).—The proceedings of the American Game Association held in New York City in January 1934 are presented in three parts, of which the first deals with the general program and game management (pp. 1–189), the second with game breeding (pp. 191–241), and the third with scientific research (pp. 243–361).

The contributions on scientific research that relate to wildlife studies, diseases of many species, surveys, other data, and conclusions include the following: Lessons from the Waterfowl Research at the W. K. Kellogg Bird Sanctuary, by M. D. Pirnie (pp. 244–248); Iowa Duck Studies, by P. L. Errington and L. J. Bennett (pp. 249–257); A Waterfowl Reconnaissance of Wood Buffalo Park, by J. D. Soper (pp. 258–266); Evaluating the Duck Sanctuary, by W. Vogt (pp. 267–271); The Eel-Grass Shortage in Relation to Waterfowl, by C. Cottam (pp. 272–279); Distribution and Migration of the Redhead, by F. C. Lincoln (pp. 280–287); Progress Report of Wildlife Disease Studies for 1933, by R. G. Green and J. E. Shillinger (pp. 288–297); Incubation of Game Birds' Eggs, by A. L. Romanoff (pp. 298–300); The Incubation of Ruffed Grouse Eggs, by E. R. Holm (pp. 301–303); Some Studies of the Nutritive Requirements of Pheasants, by L. C. Norris (pp. 304–310); Breeding Season Behavior of the Ruffed Grouse, by A. A. Allen (pp. 311–322); Developing Ruffed Grouse Areas, by F. C. Edminster, Jr. (pp. 323–328); The Cover Map and Game Census in Pheasant Management, by H. M. Wight (pp. 329–333); A Suggested Method of Measuring Cover with Particular Reference to the Cottontail Rabbit, by R. E. Trippensee (pp.

334–339); Objections to Poison as a Method of Rabbit Control, by W. Grange (pp. 340–354); Studies in Elk Management, by O. J. Murie (pp. 355–359); and Birds of Prey, by W. F. Eaton (pp. 360, 361).

[Amendments of regulations 12, 13, and 14 and of 4, 5, and 19 of the regulations respecting game animals, land fur-bearing animals, game birds, nongame birds, and nests and eggs of birds in Alaska] (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 11, Sups. 2 (1934), pp. 2; 3 (1934), pp. 2*).—These supplements consist of amendments of regulations previously noted (E. S. R., 70, p. 801).

A bibliography of the ecology of Illinois.—Part 1, A project of the academy's committee on ecological survey, compiled by A. G. Vestal (*Ill. State Acad. Sci. Trans., 27 (1934), No. 2, pp. 163–261*).—This bibliography, which is presented alphabetically by authors, includes contributions on insects and other animal pests.

The Hungarian partridge in the Great Lakes region, R. E. Yeatter (*Mich. Univ., School Forestry and Conserv. Bul. 5 (1934), pp. 92, figs. 15*).—This is a report of a study of the life history, habits, and ecological relationships of *Perdix perdix perdix*, an important game bird met with throughout central and southeastern Europe and the British Isles that has been introduced into the United States to supplement native game. This study made in the Great Lakes region indicates that it is better adapted to conditions existing in intensively farmed areas than either our native game birds or the introduced pheasant.

A list of 18 references to the literature is included.

The lizards of Trinidad, H. W. Parker (*Trop. Agr. [Trinidad], 12 (1935), No. 3, pp. 65–70, figs. 5*).—This contribution includes a key for the identification of the species of lizards occurring in Trinidad, together with an annotated list and references. While very little study has been made of the feeding habits and food preferences of Trinidad lizards, the results of examinations by D. V. FitzGerald of the stomach contents of five species are referred to.

[Report of work with oysters and oyster enemies] (*New Jersey Stas. Rpt. 1934, pp. 18–21*).—Reference is made (E. S. R., 72, p. 73) to observations of salt water enemies of the oyster, notably oyster drills (*Urosalpinx* and *Eupleura*), and the drumfish; setting of oysters; their growth in Barnegat Bay; new forms of cultch; fattening oysters on raised platforms; growth of oysters and clams in claires; and growth of food organisms in claires.

The value of cephalic structures as characters in nematode classification, with special reference to the superfamily Spiruroidea, B. G. Chitwood and E. E. Wehr (*Ztschr. Parasitenk., 7 (1934), No. 3, pp. 273–335, figs. 20*).—This is a report of a critical study of the cephalic structures of nematodes conducted during a 3-yr. period with a view to determining the value of these structures of nematodes as suitable or unsuitable characters for use in building up a sound and workable classification. The study of the cephalic structures of more than 550 nematodes is thought to furnish a basis for a reasonably sound classification. The contribution is presented in connection with a list of 20 references to the literature.

New nematodes of the genus Longistriata in rodents, G. Dikmans (*Jour. Wash. Acad. Sci., 25 (1935), No. 2, pp. 72–81, figs. 27*).—Five species of *Longistriata* taken from the small intestine of their respective hosts are described as new: *L. musculi* from *Mus musculus*, *L. norvegica* from *Rattus* sp., and *L. noviberiae* from rabbits (probably *Sylvilagus floridanus alacer* and *S. palustris littoralis*), all at Jeanerette, La.; *L. carolinensis* from the deer mouse *Peromyscus maniculatus* and the prairie meadow mouse *Microtus ochrogaster* at Great Smoky Mountains, N. C., and Vincennes, Ind.; and *L. dalrymplei*

from the muskrat *Ondatra zibethica* and the meadow mouse *M. pennsylvanicus* in New Jersey, Indiana, and Minnesota.

A key for the separation of the species of the genus *Longistriata* is included.

[Contributions on economic insects] (*Phytopathology, 25 (1935), No. 1, pp. 7, 10, 12, 17, 20, 31, 32, 37, 38*).—Contributions on economic insects, particularly as they relate to the transmission of plant pathogens, abstracts of which are here presented, include the following: Microorganisms Infecting Pines Attacked by *Dendroctonus frontalis*, by W. C. Bramble and E. C. Holst (p. 7); The Symbionts of *Pseudococcus brevipes* in Relation to a Phytotoxis Secretion of the Insect, by W. Carter (p. 10); Relation of Insect Injuries and Root Diseases in Sugar Cane, by M. T. Cook (p. 12); Spotted Wilt of Truck Crops and Ornamental Plants [Transmitted by the Onion Thrips and *Frankliniella* sp.], by M. W. Gardner, C. M. Tomkins, and O. C. Whipple (p. 17); Longevity of the Fire-Blight Organism in the Honeybee Environment, by E. M. Hildebrand (p. 20); Incubation of the Virus of Pea Mosaic in the Aphid *Macrosiphum pei*, by H. T. Osborn (p. 31); Bacterial Wilt of Corn and Its Insect Vectors, by F. W. Poos and C. Elliott (p. 32); and Technique Advantageous for the Isolation of *Ceratostomella ulmi* from Bark Beetles, by M. Walter (p. 37).

[Contributions on economic insects and mites in Idaho] (*Idaho State Hort. Assoc. [Proc.], 38 (1933), pp. 59–78, 79–86, 88, 89, 95–106, figs. 2*).—The contributions presented include the following: Economic Importance of Rodent Control, by T. B. Murray (pp. 59–66); Wire Worm Control, by M. C. Lane (pp. 66–74); The Honey Bee a Friend to the Fruit Grower, by H. H. Keck (pp. 74–78); Spider Mites and Other Pests of Fruit Trees (pp. 79–83) and Control of the Destructive Prune Worm [*Mineola scitulella* Hulst] (pp. 83–86, 88, 89), both by R. W. Haegele; 1932 Warfare on Codling Moth and San Jose Scale, by C. P. Meacham (pp. 95–97); Codling Moth Banding Demonstration Results in Nine Oregon Counties—1932, by O. T. McWhorter (pp. 97–104); and Inventory of the 1932 San Jose Scale and Codling Moth Situation, by W. H. Wicks (pp. 104–106).

[Report of work in entomology at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 75–82, 83, 93, 94*).—The work of the year with economic insects and their control referred to (E. S. R., 71, p. 67) includes that with the oriental fruit moth, substitutes for lead arsenate, onion thrips, European corn borer, Mexican bean beetle, termites, potato flea beetle, mosquitoes, oil sprays, white apple leaf hopper, gypsy moth, apiary inspection, sprays and dusts, an insect survey, white pine weevil, reduction of pine shoot moth infestation, and insect pests of tobacco.

[Work with economic insects and control of insects and rodents by the Florida Station] (*Florida Sta. Rpt. 1934, pp. 51, 52–56, 69, 84, 85, 93, 94, 96, 97*).—The work referred to (E. S. R., 72, p. 358) includes that with a species of scale of the genus *Margarodes* common on the roots of citrus; the dry wood termite *Neotermes castaneus*; the Florida flower thrips *Frankliniella cephalica bispinosa* Morg., by J. R. Watson; the Chinese lady beetle *Leis dimidiata 15-spilota*, a predatory insect of the citrus aphid, and *Paraleptomastix*, a parasite of mealybugs, by Watson and W. L. Thompson; parasitism of the southern green stinkbug by the feather-legged fly *Trichopoda pennipes* and other tachinid flies, by H. E. Bratley; bean jassid (potato leaf hopper) investigations, by A. N. Tissot; the green citrus aphid, by Watson and Thompson; control of scale insects on woody ornamentals, by J. W. Wilson; enemies of watermelons and the biology and control of field mice (*Peromyscus polionotus*) in watermelon plantings, both by C. C. Goff; the beet army worm, by Wilson; the onion thrips, by Watson; the gladiolus thrips, by Watson and Wilson; biology and

control of Florida aphids, by Tissot; fumigation for control of scales infesting grapefruit, control of the purple scale on grapefruit, control of the 4-spotted bean weevil, the pea weevil, and the rearing and fumigation of the cigarette beetle, all by R. J. Wilmot; control of the purple scale and rust mites with lime-sulfur, by Thompson; and control of cutworms, bean jassids (potato leaf hopper, *Eugnathodus abdominalis*, and *Empoasca* sp.), aphids, velvetbean caterpillar, corn ear worm, and cucumber beetles, prevalence and control of the sugarcane borer in south Florida, and the prevalence and control of rodents under field and village conditions, all by R. N. Lobdell.

[Report of work with economic insects and insecticides by the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 33–37, 46, 63, 69, 70, fig. 1*).—The work under way during the year (E. S. R., 71, p. 217) briefly referred to includes that with the onion thrips, striped cucumber beetle, potato leaf hopper, mint flea beetle, European corn borer, chinch bug, codling moth, oriental fruit moth, barium fluosilicate for garden insects, manganese arsenate, lead arsenate for control of cutworms on golf greens, and arsenic residues on apples.

[Report of work with economic insects and insecticides by the New Jersey Stations] (*New Jersey Stas. Rpt. 1934, pp. 38–45*).—The work of the year referred to (E. S. R., 72, p. 74) includes mosquito control, the effect of high frequency electric oscillation on insects, and work with the codling moth, leopard moth, insecticides, vegetable insects, wireworms, cambium borers of ornamentals (particularly the two-lined chestnut borer and *Sesia acerni*), and in apiculture.

[Report of work with economic insects and insecticides by the New Mexico Station] (*New Mexico Sta. Rpt. 1934, pp. 36–39, 40, 41, 42, 55, figs. 3*).—The work of the year referred to (E. S. R., 71, p. 217) includes that with the codling moth, psyllid yellows and comparative tests of spray materials for the control of the potato psyllid and the western potato leaf hopper, insects affecting field and garden crops (particularly grasshoppers), and control of the California prionus.

[Report of work with economic insects by the South Dakota Station], H. C. Severin (*South Dakota Sta. Rpt. 1934, pp. 38–40*).—Reference is made to the work of the year (E. S. R., 70, p. 807) with the cyrtacanthrine grasshoppers and the control of blister beetles (Meloidae).

[Report of work with economic insects by the Tennessee Station] (*Tennessee Sta. Rpt. 1933, pp. 28, 37, 38, 42, 43*).—The work of the year briefly referred to (E. S. R., 70, p. 206) includes that with red spider on red clover plants, by S. H. Essary; analytic determination of spray residues on tobacco, by G. A. Shuey; and control of the tobacco flea beetle and hornworm; the woolly apple aphid, particularly the influence of the character of the soil on the abundance of the root form; and brief notes on 6 of the more important insect pests of 1933, all by S. Marcovitch.

Sixty-fourth annual report of the Entomological Society of Ontario, 1933 (*Ent. Soc. Ontario Ann. Rpt., 64 (1933), pp. 86, figs. 8*).—The contributions presented in this report (E. S. R., 71, p. 218), issued in 1934, include the following: European Corn Borer Situation in Ontario in 1933, by L. Caesar (pp. 9–12); Some Characteristics of the Flight and Oviposition Habits of the European Corn Borer (*Pyrausta nubilalis* Hubner), by G. M. Stirrett, G. Beall, and E. Lindsay (pp. 12–21); Apple Leaf Rollers in Ontario, by J. A. Hall (pp. 21–31); Quarantine and Control Operations for the Japanese Beetle in the United States, by L. H. Worthley (pp. 32–36); The Economic Insect Fauna of Niagara Peach Orchards, by W. A. Ross and W. Putman (pp. 36–41); The Relation of Entomology to the Dutch Elm Disease, by L. S. McLaine (pp. 41–

43); A Preliminary Report on the Control of Tarnished Plant Bug (*Lygus pratensis* L.) in Celery, by R. W. Thompson (pp. 43–47); Ploughing and Discing Experiments for the Control of White Grubs in Eastern Canada, by G. H. Hammond (pp. 47–52); The Grasshopper Campaign in Manitoba in 1933, by A. V. Mitchener (pp. 52–55); Note on a New Light Trap, by J. J. de Gryse (pp. 55–57); The European Spruce Sawfly [*Diprion polytomum* Hartig] Outbreak in the Gaspe Peninsula, by R. E. Balch, L. J. Simpson, and M. L. Prebble (pp. 57–59); A Review of Entomology as Presented by the Daily and Weekly Press of Canada, by H. A. Gilbert (pp. 60–62); and A Summary of Insect Conditions in Canada in 1933, by C. R. Twinn (pp. 62–80).

[Report of work in entomology in Wye, Kent], S. G. Jary and M. D. Austin (*Jour. Southeast. Agr. Col., Wye, Kent, No. 35 (1935), pp. 9–16*).—A report is made of a survey of the occurrence of the more important pests, followed by accounts of both experimental and educational work under way.

[Report of the division of entomology], A. F. Bell (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 34 (1934), pp. 62–72, figs. 3*).—The work of the year reported upon relates particularly to the northern cane grub *Lepidoderma albohirtum* and the New Guinea sugarcane weevil.

Invertebrate enemies of cereals observed in France [trans. title], L. Mesnil (*Arq. Secç. Biol. e Parasitol., Mus. Zool. Univ. Coimbra, 2 (1933), No. 2, pp. 81–92*).—An annotated list of the insect and related enemies of cereals in France.

Researches into the biology and the damage caused by sucking insects parasitic on sugar beet, with special reference to the leaf bug Piesma quadrata Fieb. [trans. title], H. Schneider (*Inst. Belge Amélior. Betterave Pubs. No. 5 (1934), pp. 167–187, figs. 20; Fr., Dutch, Ger., Eng. abs., pp. 185–187*).—This contribution deals with the classification of various sucking insects associated with the sugar beet, of which the beet leaf hopper, *P. quadrata*, and *Calocoris norvegicus* Gmel. were the most important. In addition to these, the six-spotted leaf hopper, *Deltocephalus striatus* L., *Chlorita flavescens* Fab., *Aphis fabae* Scop., *Poeciloscytus cognatus* Fieb., *Macrosiphum* sp., and the green peach aphid are considered carriers of beet mosaic.

In considering the symptoms produced by punctures of insects, particular attention is given to the results of attacks by *P. quadrata*, which produces curling of sugar beet leaves.

Tobacco insects in 1934, D. S. Lacroix (*Connecticut [New Haven] Sta. Bul. 367 (1935), pp. 135–143, figs. 2*).—Referring to the work of the year with tobacco insects (E. S. R., 71, p. 344), brief reference is made to the prevalence of various species, tobacco flea beetle control, tobacco thrips control, tobacco hornworm (tomato worm and the tobacco worm) control, and the biology of the eastern field wireworm in tobacco soils.

[Contributions on cranberry insects and their control] (*Wis. State Cranberry Growers' Assoc. [Proc.], 47 (1933), pp. 11–13, 15–19, 26–39*).—Contributions relating to cranberry insects presented at the annual meeting of the association held in December 1933 include the following: Current Insect Problems and New Insecticides, by E. L. Chambers (pp. 11–13); Cranberry [Insect] Problems of 1933, by V. C. Goldsworthy (pp. 15–19); Why Insect Control Problems Are on the Increase in Wisconsin, by E. L. Chambers (pp. 26–33); and 1933 Insect Situation in Wisconsin and Control Methods, by V. C. Goldsworthy (pp. 33–39).

The fumigation of citrus trees in the eastern Cape Province, B. Smit (*So. African Jour. Sci., 31 (1934), pp. 442–461, figs. 2*).—A somewhat extended account of control work with the California red scale, by far the worst

insect pest of citrus in the eastern Cape Province, in which area there are more than a million bearing citrus trees from which over 750,000 cases of fruit were exported the preceding year. As the result of tests and work conducted, the dust methods of fumigating citrus trees are said to have come very largely into use in this Province.

A study of the most important insect pests that confront the citrus grower in the eastern Province, B. SMIT (*So. African Jour. Sci., 31 (1934), pp. 439–441*).—In addition to the California red scale, considered on page 206, the author deals briefly with other important pests of citrus occurring in the eastern Cape Province, including the black citrus aphid (*Aphis tavaresi*), the Mediterranean fruit fly, the citrus mealybug, and the orange thrips.

A new pest of tea in south India, Ereboenis saturata gen. et sp. nov., S. ANANDA RAU (*Planters' Chron., 30 (1935), No. 2, pp. 28–30, figs. 4*).—A pyralid the larvae of which skeletonizes tea leaves is described and reported upon.

[Contributions to forest entomology] (*[Gt. Brit.] Dept. Sci. and Indus. Res., Forest Prod. Res. Bd. Rpt., 1933, pp. 28–36, fig. 1*).—Following a brief account of laboratory tests of wood preservatives for the prevention of insect attack and statistical methods in entomology, the damage caused by *Lyctus* powder-post beetles, factors affecting *Lyctus* attack, *Lyctus* control, the deathwatch beetle *Xestobium rufo-villosum*, pinhole borer damage to Empire timbers, and insecticide tests are considered.

[Lists of United States patents relating to insect traps], compiled by R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Pat. Lists, 1934, Nos. 27, pp. [4]; 28, pp. 5; 29, pp. [10]; 30, pp. 8; 31, pp. [6]; 32, pp. 6; 33, pp. 15; 34, pp. 13; 35, pp. [4]; 36, pp. 6; 37, pp. [11]; 38, pp. [12]; 39, pp. [13]; 40, pp. 8*).—These further lists of United States patents issued from 1917 to 1933, inclusive (E. S. R., 72, p. 502), relate, respectively, to implements for catching insects; traveling suction machines; miscellaneous devices for combating insects; nozzles for insecticide sprayers; handpump atomizer-type sprayers; nozzle devices for dissolving and mixing insecticides; insecticide sprayers, parts 1 and 2; driers for washed fruit; and apparatus for washing insecticide residues from fruits and vegetables—parts 1, tank washers, 2, scrubbers and assorters, 3, conveying washers, 4, conveying brush washers, and 5, miscellaneous devices.

Some entomogenous fungi common in the Argentine Republic and the possibilities of their agricultural application [trans. title], J. B. MARCHIONATTO (*Rev. Facult. Agron. y Vet. [Buenos Aires], 7 (1934), No. 3, pp. 571–584, figs. 8*).—The entomogenous fungi here considered include *Beauveria globulifera* (Speg.) Picard from divers Coleoptera, *Schistocerca paranensis*, etc.; *Cephalosporium lecanii* Zimm. from several coccids; *Ophionectria coccicola* (E. & E.) Berl. & Voglino from the purple scale; *Peziotrichum saccardinum* Rangel from the San Jose scale; *Sporotrichum paranense* Marchion. from *Schistocerca paranensis; Myriangium duriaei* Mtgn. & Berkley from the San Jose scale and the California red scale; and *Sphaerostilbe coccophila* Tulasne from the Florida red scale.

An improved laboratory apparatus for fumigation experiments, H. H. S. BOVINGTON (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 704–724, pl. 1, figs. 7*).—The author presents an account of a new type of laboratory apparatus for fumigation experiments with insects or other small animals, together with a description of the experimental procedure adopted. References to appliances used by other investigators are referred to in connection with a list of 26.

An apparatus for testing contact insecticides, F. TATTERSFIELD (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 691–703, pl. 1, figs. 5*).—A description is given of the

design of two atomizers for use in quantitative laboratory spraying for testing contact insecticides as employed at the Rothamsted Experimental Station. "Tables and graphs are given showing the weights of spray delivered by each form upon known areas placed in different positions inside the spray jars, and an examination is made of the change in the distribution of the spray with the progressive closure of the orifice and increase in the distance from the orifice of the surface sprayed."

Insecticides from the tar barrel, F. Z. Hartzell (*Farm Res. [New York State Sta.], 1 (1935), No. 3, pp. 5, 9*).—In this practical contribution the author calls attention to the value of tar distillate emulsions used alone and when combined with lubricating oil for control of insect enemies of fruit trees. The information is based upon investigations at the station, the details of which have been given in earlier reports (E. S. R., 67, p. 708; 70, pp. 501, 808; 71, p. 345).

Studies on fumigation with chloropicrin, C. Harukawa and S. Kumashiro (*Ber. Ōhara Inst. Landw. Forsch., 6 (1934), No. 3, pp. 407–430, fig. 1*).—In fumigation experiments eggs of the Angoumois grain moth were found to be more susceptible to chloropicrin gas than the larvae and pupae. The eggs could be killed by fumigation for 48 hr. even with as weak a dosage as 0.25 lb. per 1,000 cubic shaku (approximately equal to 1,000 cu. ft.) when the fumigation box contained no other material than a small quantity of grain to be fumigated. In order to kill 100 percent of the full-grown larvae and pupae, it was necessary to fumigate for 48 hr. with at least 0.5 lb. of chloropicrin per 1,000 cu. ft. "When the fumigation box is provided with a passage for gas diffusion, from 93 to 99 percent of all stages of the Angoumois grain moth can be killed at any position in the fumigation box by fumigating for 72 hr. with a dosage of from 1.5 to 2 lb. of chloropicrin per 1,000 cubic shaku. If the air temperature at the time of fumigation is fairly high (27° C. or higher), nearly the same result can be obtained by fumigation for 72 hr. with a dosage of 1 lb."

In a comparison made with the Angoumois grain moth, adult rice weevils appeared to be slightly more susceptible to chloropicrin gas than the grain moth larvae, nearly 100 percent being killed by fumigation for 72 hr. with 1 lb. of chloropicrin per 1,000 cu. ft. when the air temperature was above 22°.

Barley seeds were found to be more susceptible to chloropicrin gas than wheat, and the germination of barley was reduced by 20 to 30 percent by fumigation for 72 hr. with 1 lb. of chloropicrin per 1,000 cu. ft. The germination of wheat was almost unaffected by fumigation of the same duration and dosage when fumigated after the end of July.

The insecticidal properties of some east African plants, I, R. R. Le G. Worsley (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 649–669*).—The studies reported have shown that extracts of *Tephrosia vogelii* are equal to, or even better than, "nicotine for general spray purposes; they are somewhat less toxic and somewhat slower in action than pyrethrum sprays. *T. vogelii*, however, possesses the very great advantage of being extremely widespread in east Africa, growing equally well in the hills up to between 5,000 and 6,000 ft. altitude (possibly higher) and on the plains down to sea level."

A preliminary study on the rotenone content of some derris roots collected from different parts of the Philippines, F. T. Adriano, S. B. Oliveros, D. Tabije, and F. Crisostomo (*Philippine Jour. Agr., 5 (1934), No. 4, pp. 245–254*).—The authors have found in analyses for the presence of rotenone that samples of derris roots from Misamis and Camarines Sur are high yielding;

those from Albay, Cavite, La Union, Laguna, and some samples from Cebu and Misamis give medium yields; while those from Ilocos Sur, Bataan, Davao, Mindoro, and some from Cavite contain very little crude rotenone. The results of the study seem to confirm the reports of other investigators that small roots, at most 1 cm in diameter, contain a greater quantity of the active principle than the larger roots.

The effect of environmental conditions upon pyrethrum (Chrysanthemum cinerariaefolium), I, II, J. T. Martin and F. Tattersfield (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 670–681, pl. 1; 682–690, pls. 2*).—The first contribution from the Rothamsted Experimental Station (pp. 670–681) reports upon studies made of the effect of soil fertility upon the insecticidal value of the flowers of pyrethrum in a series of pot experiments. On heavy soil the pyrethrin I content of the flowers was not increased by the application of fertilizers. The plants produced good yields of flowers, rich in pyrethrins, when grown in soil of low fertility. Under conditions of normal growth and vitality, the extent of production of the pyrethrins in the flowers was characteristic of the individual plant and was dependent upon some factor which appeared to be genetical in character. In the fully open flowers the complete disk florets contained 90 percent of the total pyrethrins present in the flowers, and of this the greater part was found to be located in the ovaries.

The second contribution (pp. 682–690) reports upon studies made of the effects of light, temperature, and dormancy upon pyrethrum. The partial shading of the plant during the 5 mo. preceding flowering resulted in the production of smaller flowers with a reduced pyrethrin content. The successful flowering of the plant was largely dependent upon the relative temperatures experienced throughout the year. A dormant period, dependent upon sufficiently low winter temperatures, was shown to be necessary for the normal production of large numbers of flowers.

Cold weather and its effect on injurious insects, G. A. Mail (*Montana Sta. Circ. 146 (1935), pp. 8, figs. 4*).—A practical discussion of the subject in which it is shown that in most cases a severe cold spell has no effect on insects injurious to farm crops. A diagram in given to show the degree of protection afforded to hibernating insects by snow covering in subzero weather.

The stone flies, or Plecoptera, of Illinois, T. H. Frison (*Ill. Nat. Hist. Survey Bul., 20 (1935), Art. 4, pp. V+281–471, pl. 1, figs. 344*).—This contribution summarizing studies of the plecopteran fauna of Illinois conducted more or less continuously since 1926 takes up the status of the group; stone fly structure; biology of the order; and collecting, rearing, and preserving stone flies. It is followed by a catalog of species, including classification, description, habits, and records of Illinois stone flies. The genus *Hydroperla* is erected, and 8 forms are described as new to science. A bibliography of seven pages is included.

A study of Mormidea poecila Dall., F. A. Squire (*Agr. Jour. Brit. Guiana, 5 (1934), No. 4, pp. 242–252, pls. 3, fig. 1*).—This contribution deals with the pentatomid *M. poecila*, commonly called "paddy bug" or "ghandi", a well-known pest of paddy in British Guiana. This bug is thought to do as much damage to paddy as does the sugarcane borer.

Fighting the chinch bug on Illinois farms, W. P. Flint, G. H. Dungan, and J. H. Bigger (*Illinois Sta. Circ. 431 (1935), pp. 16, figs. 6*).—Measures for combating the chinch bug are summarized and illustrated.

Notes on two hemipterous pests of the coconut in the British Solomon Islands, R. J. A. W. Lever (*Agr. Gaz. [Brit. Solomon Isl.], 1 (1933), No. 3, pp. 2–6, figs. 14*).—These notes relate to *Dasynus* sp. and *Axiagastus campbelli* Dist.

Psyllia peregrina Först., the hawthorn race of the apple sucker (P. mali Schmidb.), K. B. Lal (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 641–648*).—As previously noted (E. S. R., 71, p. 220), the author has found that *P. peregrina* and *P. mali* of hawthorn are identical and only the seasonal forms of one and the same species, being morphologically indistinguishable from *P. mali* on apple. "Although morphologically similar, specimens of *P. mali* of hawthorn and apple do not mate with each other, nor do they oviposit interchangeably on each other's host plants. The nymph of either when transferred to the food plants of the other does not survive very long. *P. mali* of the apple has a biological race on hawthorn, which has long been known as *P. peregrina*. This race should be distinguished as *P. mali* Schmidb. race [*P.*] *peregrina*, which is the name it is proposed to assign to it. The two races, in view of their dissimilar nymphs, furnish an instance of poecilogony."

Studies on aphides infesting the potato crop.—II, Aphis survey—its bearing upon the selection of districts for seed potato production, W. M. Davies (*Ann. Appl. Biol., 21 (1934), No. 2, pp. 283–299, pls. 2, figs. 4*).—In continuation of earlier work (E. S. R., 69, p. 238), the author reports upon a comparative study made during 1928–33 of the aphid infestation at certain successful seed potato producing centers, where there had been no increase in virus infection among the stocks, and also at some unsuccessful centers, where the increase in virus infection had been large and rapid. The main observations reported deal with the green peach aphid, the species that is generally responsible for the leaf roll disease of potatoes.

The caddis flies or Trichoptera of New York State, C. Betten et al. (*N. Y. State Mus. Bul. 292 (1934), pp. 576, pls. 67, figs. 61*).—Following a brief introduction and discussion of the geographic distribution of the Trichoptera, their morphology is considered, including accounts of the antenna of the adults by B. L. Kjellgren and the larvae by A. W. Orcutt. The habits of the Trichoptera are discussed by M. B. Davis, followed by accounts of the relationships of the order and of the phylogeny of the families. "There are here included generic descriptions, with keys, of all North American genera, and specific descriptions of all North American species east of the Mississippi and north of Mexico. All other North and Central American species are listed with complete references so that the report may serve as a catalog for this continent. The total number of genera reported for the North American Continent including Greenland and the West Indies is 123, and the number of species, as listed in this report, 568. Of these species, 261 are from the United States and Canada east of the Mississippi River, and 271 from the western parts of those countries, from Greenland, Central America, and the West Indies. Thirty-six additional species have so far been listed as common to the areas east and west of the Mississippi River, but that number will doubtless be very greatly increased as further studies are made."

Cape Cod pitch pine: Its resistance to gipsy moth defoliation and its advantages as a forest tree, R. C. Hall (*Jour. Forestry, 33 (1935), No. 2, pp. 169–172, fig. 1*).—The study reported is said to have demonstrated that from the standpoint of damage by the gypsy moth pitch pine is far superior to any other common native tree species on Cape Cod. The study has shown that this pest prefers the foliage of hardwoods to that of pitch pine, and will feed on the latter only when all other available food is exhausted. When it is driven through necessity to feed upon pitch pine, it first eats only the old needles, and only in very exceptional cases will it feed upon the new growth.

Carpenter worm: Biology and control, J. A. Munro and A. C. Fox (*North Dakota Sta. Bul. 278 (1934), pp. 28, figs. 8*).—The occurrence of the carpenter worm, its economic importance, biology, and control as applied to North

Dakota are taken up in this contribution. It is recorded from 23 counties of the State where its attack upon the green ash is of particular importance. The American elm, soft maple, bur oak, and 8 species of poplar also serve as host trees in that State.

A list is given of 48 references to the literature.

An account of the western hemlock looper Ellopia somniaria Hulst on conifers in British Columbia, G. R. Hopping (*Sci. Agr., 15 (1934), No. 1, pp. 12–29, pls. 2, fig. 1; Fr. abs., pp. 28, 29*).—This contribution, which reports upon a study of the biology and control of *E. somniaria*, calls attention to parasites, predators, and weather conditions as influencing the progress of outbreaks in British Columbia. Of 3 dipterous and 11 hymenopterous species reared from some stage of *E. somniaria*, the tachinid *Winthemina cilitibia* Rand was the most effective parasite. In three airplane dusting projects, calcium arsenate 1 part to 6 parts of hydrated lime applied at the rate of 26 lb. per acre, resulting in a coverage of from 18 to 24 lb. per acre, is estimated to have destroyed from 75 to 85 percent of the larvae over an area of 800 acres at a cost of $7.96 per acre.

The greater spike moth Tirathaba rufivena Walk. and its parasite Apanteles tirathabae Wilk., R. J. A. W. Lever (*Agr. Gaz. [Brit. Solomon Isl.], 1 (1933), No. 3, pp. 7, 8, fig. 1*).—*T. rufivena*, which normally attacks coconut and swamp palm, has been reported rolling the leaves of the French bean in the Federated Malay States and feeding on the skin of growing bananas in Queensland. It is attacked in the first and second instars by *A. tirathabae*, a brief account of which is presented.

Sugarcane borers and their control in the Mysore State (*Mysore Agr. Dept. Circ. 53 (1934), pp. 9, pls. 2, figs. 10*).—*Argyria sticticraspis* and *Diatraea venosata* are described as the most important dead heart borers and *Scirpophaga nivella* and *S. monostigma* as the central shoot borers.

Isodevelopmental zonation of Chilo simplex Butler in Japan [trans. title], N. Yagi (*Jour. Imp. Agr. Expt. Sta., Nisigahara-Mati, Tokyo, Japan, 2 (1934), No. 3, pp. 381–394, pls. 4, figs. 2; Eng. abs., p. 394*).—The author's studies of the Asiatic rice borer have shown the number of generations to vary as follows: 5 or 6 in Taiwan (Formosa), 4 in Ryukyu, 3 in the districts lying all the way from southern Kyushu to the Inland Sea and the coast of Tokaido, 2 in the districts northward to Aomori Prefecture, 1 at Ishinomaki, Miyagi Prefecture, and 1 in Hokkaido.

The iris borer, H. F. Dietz (*Amer. Iris Soc. Bul. 55 (1935), pp. 74–78*).—A practical summary of information on the iris borer.

Report on status of the European corn borer in 1934, A. M. Vance (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1934, pp. 9, pls. 3*).—The occurrence of the European corn borer in the United States in 1934, based upon a survey conducted from August 15 to October 5 by 15 men in 1,580 cornfields located in an area comprising 125 counties in the States of Michigan, Indiana, Ohio, Pennsylvania, New York, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, and New Jersey is reported, the details being given in table, chart, and map form.

The European corn borer on Long Island, S. M. Dohanian (*Psyche, 41 (1934), No. 4, pp. 214–220, fig. 1*).—A discussion of the European corn borer as it occurs on Long Island, where the first infestation was discovered in Kings County in August 1923.

Response of European corn borer moths to colored lights, E. G. Kelsheimer (*Ohio Jour. Sci., 35 (1935), No. 1, pp. 17–28, figs. 3*).—Field and laboratory work at the Ohio Experiment Station was so outlined as to endeavor particularly to determine the influence of lights of different colors on the

behavior of the European corn borer. It was found that "when the filters were arranged in the apparatus in the ascending or descending order of wave length, and the light transmitted through the filters was in all instances of uniform or comparable intensity, the moths responded in significantly greater numbers to the lights of short wave length than to those of long wave length; that is, the blue light of the series attracted more moths than did the red light on the opposite end of the series."

Ecological studies of pink bollworm (Platyedra gossypiella Saunders), M. A. HUSAIN, M. H. KHAN, and N. AHMAD (*Cur. Sci. [India], 3 (1935), No. 7, pp. 304, 305*).—These notes relate to the biology of the pink bollworm as observed in the Punjab.

On the biology of some Tortricidae (Lepidoptera) infesting fruit trees in Britain.—I, Cacoecia (Tortrix) podana Scop., G. L. HEY and F. J. D. THOMAS (*Jour. Pomol. and Hort. Sci., 12 (1934), No. 4, pp. 293–310, pls. 2, fig. 1*).—An account is given of a tortricid widely distributed throughout Europe but not known to occur in America, although intercepted during 1919–20 in a cargo of *Rosa rugosa* from the Netherlands. Damage by the larvae to fruit trees in Great Britain is said to be on the increase both as regards spring damage to fruit buds and fruitlets and autumn damage to fruit on the trees and in store. Descriptions of its stages and biology are followed by discussions of its economic importance, parasites, and control. A list is given of 42 references to the literature.

The pineapple bud moths in Hawaii, G. V. B. HERFORD (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 530–541*).—The author has found in studies in Hawaii that *Pyroderces rileyi* Wlsm. and *Ereunetis flavistriata* Wlsm. are the two most important species of bud moth in Oahu, both being distributed over the island and the latter being the most common. They were found to be most numerous in old ratoon fields, where they feed on dead plant tissue. They are also found on young fruits, where, however, they appear to do very little damage.

A list is given of 27 references to the literature.

Heat as a means of controlling the Angoumois grain-moth, I, C. HARUKAWA and S. KUMASHIRO (*Ber. Ōhara Inst. Landw. Forsch., 6 (1934), No. 3, pp. 393–406, fig. 1*).—In the experimental study of the resistance of the egg, larva, and pupa of the Angoumois grain moth to high temperatures, the egg was found to be highly susceptible and killed by exposure for 5 min. to 60° C. Larvae and pupae are more resistant than the egg, and 100 percent cannot be killed unless exposed to 60° for from 1 to 1.5 hr. As the temperature is raised the duration of exposure which is required becomes gradually shorter, and at 80° only 15 to 20 minutes' exposure is required to kill almost 100 percent. In order to kill 100 percent of the larvae and pupae, a longer exposure and a higher temperature seem to be necessary than those which earlier investigators have considered to be sufficient.

Effects of temperature and humidity on the clothes moth larva, Tineola biselliella Hum. (Lepidoptera), K. MELLANBY (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 476–482*).—In experiments conducted in which fasting webbing clothes moth larvae were exposed to temperatures of 10°, 22°, 30°, and 35° C. and four humidities at each temperature (0, 30, 60, and 90 percent), the rate of loss of weight was determined and also the amonnt of solid matter lost.

"In moderately dry or moderately moist air the larvae maintained their water balance, but in very dry air the proportion of solid matter in their bodies rose and in moist air it fell. A considerable amount of dry matter was lost by excretion and the production of silk, in addition to metabolism. These processes were not affected by humidity. The results suggest that the rate at which

water is evaporated from the larvae is proportional to the saturation deficiency of the air."

Recent trials of repellents for narcissus fly, W. DOWNES (*Canad. Ent., 67 (1935), No. 2, pp. 21–24*).—Working at Victoria, B. C., the author found that while crude naphthalene was outstanding as a repellent for the narcissus bulb fly, even though applied as late as June 15, it cannot be employed except in weaker strengths due to its severe burning of the foliage. Of the other materials tested, ialine, a brown sirupy fluid smelling strongly of iodoform and manufactured in England, applied with lime as a dust or with summer oil as a spray, gave distinct promise. Hydrated lime dusted heavily at the bases of the plants gave a decidedly repellent effect and seems to have the most practical value as it can be readily obtained, is easily applied, and can cause no injury. Sawdust piled along the rows had a decidedly repellent effect. Infestation was not reduced to any important extent by cheesecloth hung down at the sides to shade the edges of the bed.

Aggressive parasitism of a millipede by a phorid, J. G. MYERS (*Roy. Ent. Soc. London, Proc., 9 (1934), No. 2, pp. 62, 63*).—The observations reported relate to parasitism of a black julid millepede by the phorid *Megaselia juli* Brues.

The bot flies of goats and sheep, H. L. BHATIA (*Agr. and Livestock in India, 4 (1934), No. 5, pp. 516–523, pls. 2*).—This contribution consists of a brief outline of the damage to goat skins and the monetary loss due to *Hypoderma crossii* Patton and the common cattle grub in India; also brief accounts of the life history of *H. crossii* and the sheep botfly, with control measures.

The sheep blowfly problem in North Wales, W. M. DAVIES (*Ann. Appl. Biol., 21 (1934), No. 2, pp. 267–282*).—Following a brief introduction the author reports upon a survey of sheep maggot flies, the life history of *Lucilia sericata* Meig. in North Wales, the age of sheep as a factor influencing attack, and the breed of sheep in relation to attack. *L. sericata* has been found to be the sheep blowfly of the Province, larvae of *Calliphora erythrocephala* Meig. having been found present in two advanced cases only and then in small numbers.

Experiments in 1932 with attrahents for the olive fruit fly [trans. title], G. BUA (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 6 (1933), pp. 56–77, figs. 5; abs. in Rev. Appl. Ent., 21 (1933), Ser. A, No. 9, pp. 440, 441*).—In continuation of the experiments in 1931 (E. S. R., 70, p. 658), it was found that Dacivoro D. F. and the ammonium salts, especially the fluoride and the hydrate, were superior to the molasses-arsenic bait and to Dachicida F. 1931.

Improved methods in the culture of sterile maggots for surgical use, W. ROBINSON (*Jour. Lab. and Clin. Med., 20 (1934), No. 1, pp. 77–85*).—Improvements in cultural technic are said to have been so extensive as to require a complete revision of the methods for sterile maggot production previously described (E. S. R., 71, p. 841). Detailed descriptions are given of methods and equipment that have been found satisfactory for this purpose. An outline of the biology of blowflies as involved in the cultural processes is also given.

On the bionomics and structure of some dipterous larvae infesting cereals and grasses.—II, Opomyza germinationis L., I. THOMAS (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 519–529, figs. 5*).—In continuation of earlier studies (E. S. R., 70, p. 811), it was found in the laboratory that the larval food plants of *O. germinationis* include oats, wheat, barley, *Lolium perenne*, *L. italicum*, *Dactylis glomerata*, *Festuca rubra*, *Poa trivialis*, and *Cynosurus cristata*. In the field only a few larvae were found in cereals, grasses being the chief host plants. The injury is similar to that caused by the larva of the frit fly. There are three larval instars and pupation takes place inside the host plant near the ground. Adults emerge in mid-June and live until early

November. In the laboratory eggs were laid in September and October either on the plants generally near the ground level or on the soil near the seedlings. A description is given of the three larval instars, the egg, and the puparium.

A study of the beet fly (Pegomyia) in Belgium in 1933 [trans. title], L. Decoux and G. Roland (*Inst. Belge Amélior. Betterave Pubs., No. 5 (1934), pp. 139–165, figs. 5; Fr., Dutch, Ger., Eng. abs., pp. 163–165*).—In a further study (E. S. R., 70, p. 67) of the beet fly *P. hyoscyami* Panz. var. *betae* Cur. in 1933, particularly of its natural enemies, parasitism was found to increase gradually from 4 to 13 percent in the first two generations and attain an average of 34 percent for the three successive generations. *Opius ruficeps* Wesm. and *Stilpnus gagates* Grav. were present in certain localities but in less numbers than those important in 1932, which included *O. nitidulator*, *O. spinaciae*, *O. fulvicollis*, and *Phygadeuon pegomyiae*.

It was found that brushing the leaves with a rotating brush in dry weather, when the young plants are covered with newly laid eggs of the first generation, will remove 50 percent of them. Disinfection of the soil with a product having a sulfur base produced a nearly total destruction of the pupae present. The repeated experiments of late singling of the beets confirmed its efficacy as a means of limiting the development of the fly and especially when a heavy oviposition took place in the first generation.

General information about the Japanese beetle in the United States, C. H. Hadley and I. M. Hawley (*U. S. Dept. Agr. Circ. 332 (1934), pp. 23, pl. 1, figs. 15*).—The data here presented include the occurrence of the Japanese beetle in the United States, manner of spread, recognition in its different stages of development, seasonal history and habits, food plants, manner of feeding, food habits of the larva, natural factors limiting abundance, and other beetles mistaken for it.

The relation of the sugar content and odor of clarified extracts of plants to their susceptibility to attack by the Japanese beetle, F. W. Metzger, P. A. van der Meulen, and C. W. Mell (*Jour. Agr. Res. [U. S.], 49 (1934), No. 11, pp. 1001–1008, fig. 1*).—The authors report upon work conducted at the Japanese beetle laboratory at Moorestown, N. J., in the course of which 97 species and varieties of plants were analyzed for reducing-sugar content in order to determine the relationship between the sugar content of the plants and their susceptibility to attack by the Japanese beetle. Details of the experimental results are presented in tables.

The odor imparted by the plant material to the clarified extracts, as well as the sugar content, appeared to be a significant factor in immunity or susceptibility to beetle attack. "Of the plants having the clarified extracts characterized by a fruity odor, 70.9 percent of those with a reducing-sugar content of 15 to 30 mg per gram of plant material, and 46.7 percent of those with a sugar content under 15 mg were seriously infested. Of those without the fruity odor the corresponding percentages were 21.5 and 18.2. The sucrose content could not be determined because of the coloration of the various extracts. The nature of the substances causing the fruity odor of the clarified extracts was not determined."

The occurrence of the longhorn beetle Hylotrupes bajulus L. in England, E. A. Parkin (*Forestry, 8 (1934), No. 2, pp. 150–154, pl. 1*).—A brief account is given of the longhorn beetle *H. bajulus*, several instances of damage by which to softwood roof timber have come to the attention of the Forest Products Research Laboratory. Although of considerable economic importance on the Continent, this borer has heretofore been found only rarely in Great Britain.

On the pigmy mangold beetle (Atomaria linearis Steph.) and methods for its control, E. E. Edwards and J. K. Thompson (*Ann. Appl. Biol., 21 (1934), No. 2, pp. 300–318, pls. 2*).—A report is made of an extensive investigation of the pigmy mangold beetle *A. linearis* on sugar beet and mangold conducted during the last 6 yr. in both the field and laboratory. In control experiments in the field the use of phenol and magnesium sulfate at the rate of 1 and 5 percent, respectively, as a seed steep was found to be the most effective. There is said to be evidence that the common practice on the Continent and in certain districts in Great Britain of sowing crude naphthalene with sugar beet seed as a deterrent against the beetle results in serious damage to germination.

In addition to mangold and sugar beet, the beetle is recorded for the first time in Great Britain on garden beet and white goosefoot (*Chenopodium album*).

The coconut leaf-beetle of the Santa Cruz group, R. J. A. W. Lever (*Agr. Gaz. [Brit. Solomon Isl.], 1 (1933), No. 4, pp. 11, 8, figs. 2*).—An account is given of a hispid leaf beetle feeding on leaves of young coconut palms that is related to if not identical with *Promecotheca opacicollis* Gestro.

A study of the fig beetle Cotinis texana Casey, A. A. Nichol (*Arizona Sta. Tech. Bul. 55 (1935), pp. 157–198, figs. 14*).—Following a brief discussion of the distribution and taxonomic position of *C. texana*, the author reports upon studies of its morphology, life history, natural enemies, and control, many of the details being given in tabular and chart form.

The beetle is native to Arizona but limited in its distribution there to the Gila River and its tributaries and to the upper fork of the Bill Williams River. "Its life cycle is completed in 1 yr., beginning with eggs laid in August and September. Mature beetles are released from the ground by the first soaking rain of the midsummer rainy season. Temperature limits its distribution to altitudes between 500 and 5,000 ft. The amount of moisture and organic matter limits the lateral distribution. Irrigation has increased its numbers many thousandfold by greatly increasing the amount of suitable breeding ground. Ninety-nine percent of the beetle population is produced from corrals and stack bottoms.

"The only biological control of importance is effected by a fungus in years of excess rainfall. Effective control is obtained by a thorough cleaning of corrals and stack bottoms in February, March, and April, or by giving the eggs and early first instar larvae a 48-hr. exposure to flood water. No practical methods of control of the adults have yet been found."

A list is given of 24 references to the literature.

The wireworm pest and its control in central Queensland sugar-cane fields, W. A. McDougall (*Queensland Agr. Jour., 42 (1934), No. 6, pp. 690–726, figs. 25*).—The injury caused to cultivated crops by *Lacon variabilis* and its morphology, biology, and control are dealt with at length, much being presented in tabular form.

Studies in population physiology.—III, The effect of conditioned flour upon the productivity and population decline of Tribolium confusum, T. Park (*Jour. Expt. Zool., 68 (1934), No. 2, pp. 167–182, fig. 1*).—Studies on the effect of heavily autoconditioned flour (flour in which concentrated populations of these tenebrionid beetles have lived) upon the population decline of the confused flour beetle are reported, with a list of 28 references to the literature.

"It was found that experimental *Tribolium* adults, living in such conditioned flour, produced significantly fewer eggs than did control beetles populating

fresh flour. The number of eggs produced by the experimental beetles became less at each of the six 10-day period counts. This inhibitory effect was shown to be reversible, since the experimental beetles were returned to the control level of egg production by reintroduction to fresh flour. A lowered fecundity with age is also demonstrated. These facts are of importance in an understanding of the population physiology of these organisms."

Studies in population physiology.—IV, Some physiological effects of conditioned flour upon Tribolium confusum Duval and its populations, T. PARK (*Physiol. Zool., 8 (1935), No. 1, pp. 91–115, fig. 1*).—The author's further studies (see above) have shown that conditioned flour reduces the cannibalism or egg eating of the confused flour beetle about half that of the control rate of beetles in unconditioned flour. "Conditioned flour reduces the fecundity of virgin females about two-thirds that of controls. Growing out of this experiment is a suggestion as to the possible existence of a reproductive rhythm of egg production for the flour beetle. Conditioned flour reduces greatly the fecundity of fecundated females mated with one male. This is not an irreversible effect as the conditioned forms may be returned to control level of reproduction by reintroduction to fresh flour. A male from conditioned flour can lower the fecundity of females from fresh flour when mated to the latter. On the other hand, fresh flour males cannot raise the fecundity of conditioned flour females. . . . Conditioned flour definitely increases the time and variability of larval metamorphosis. Conditioned flour drastically increases the mortality of larval metamorphosis."

It is pointed out that these conclusions apply to the effects of heavily conditioned flour only.

A list is given of 17 references to the literature.

Queensland pine beetle, A. R. BRIMBLECOMBE (*Queensland Agr. Jour., 42 (1934), No. 5, pp. 546–560, figs. 13*).—This discussion relates to *Calymmaderus incisus* Lea, which has recently been discovered to be the cause of considerable and serious damage to seasoned hoop pine in Queensland. The European furniture beetle *Anobium punctatum* DeG. occurs in Queensland so far only to a minor extent and only in hoop pine. In this article it is compared and contrasted with *C. incisus* in all details.

Observations on the biology of the Lyctus powder-post beetles, with special reference to oviposition and the egg, E. A. PARKIN (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 495–518, figs. 9*).—The life history and habits of the *Lyctus* beetles, particularly *L. brunneus* Steph., are reported upon. External sex characters are given for 6 species reared from timber. A list of 24 references to the literature is included.

The metamorphosis of Calandra oryzae, F. V. MURRAY and O. W. TIEGS (*Quart. Jour. Micros. Sci. [London], n. ser., 77 (1935), No. 307, pp. 405–495, pls. 5, figs. 20*).—This contribution on the rice weevil is presented with a list of 76 references to the literature.

Methods of obtaining emergence of Tiphia adults from imported cocoons for use against the Japanese beetle, H. W. ALLEN and R. W. BURRELL (*Jour. Agr. Res. [U. S.], 49 (1934), No. 10, pp. 909–922, figs. 10*).—In work at the Japanese beetle laboratory at Moorestown, N. J., the authors succeeded in largely overcoming the difficulty previously experienced in securing sufficient adults from imported *Tiphia* parasite cocoons for effective colonization. The method found generally successful consists in the use of large cellar incubators in which a humidity of 90 percent is maintained and the temperature carefully regulated within a range of from 35° F. in January to 76.3° in July. The adoption of this method resulted in an emergence of 12,832 from 48,075 cocoons

in 1928, as compared to 998 adults issuing from 19,474 cocoons in 1926, when the study was begun. *T. pullivora* A. & J., *T. popilliavora* Roh. (Chinese race), *T. vernalis* Roh., and *T. bisoculata* A. & J. responded differently to various methods tested, but all emerged much better in the cellar incubators than with any other method employed. Not only has the use of cellar incubators increased the emergence, but the associated feature of regulated temperature has made it possible to obtain emergence for each species at the particular period favorable for liberation.

Studies of solid stem wheat varieties in relation to wheat stem sawfly control, H. J. Kemp (*Sci. Agr., 15 (1934), No. 1, pp. 30–38, fig. 1; Fr. abs., p. 38*).—Observations and experiments conducted at the Dominion Experimental Station, Swift Current, Sask., indicate that damage by the wheat stem sawfly might be reduced to proportions of little consequence by the use of solid stem varieties of wheat. It is pointed out that such varieties should, however, include kinds that are of good milling and baking value suitable for bread making purposes.

Morphology, life history, and habits of the honeybee parasite Acarapis woodi (Acarina) [trans. title], **Z. Örösi-Pál** (*Ztschr. Parasitenk., 7 (1934), No. 2, pp. 233–267, figs. 12*).—This contribution on *A. woodi* is presented with a list of 31 references to the literature.

The European tarsonemid strawberry mite identical with the American cyclamen mite, H. E. Ewing and F. F. Smith (*Ent. Soc. Wash. Proc., 36 (1934), No. 8–9, pp. 267–268*).—It is concluded from a comparative study of the morphology and host plant preferences of material from Europe and America that *Tarsonemus pallidus*, described by Banks in 1899 (officially called the cyclamen mite), and *T. fragariae*, described by Zimmerman in 1905, represent a single species; thus the name *T. pallidus* holds by priority and *T. fragariae* becomes a synonym.

On the biology of the mite Glycyphagus domesticus De Geer (Tyroglyphidae, Acarina), A. M. Hora (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 483–494*).—Of the eight mites listed as most commonly found in houses, the furniture mite *G. domesticus*, considered the most important form, was studied. The life history of this form is characterized by the occurrence of the hypopus, a cystlike stage found only among the Tyroglyphidae. Humidity and temperature were found to have a marked effect on the life of the mite, tables being given to show the effect of (1) humidity on the adult and (2) humidity and temperature on the hypopus and egg. Experiments with chemicals briefly reported upon indicate that methyl salicylate is very toxic at small concentrations, and that carbon tetrachloride is lethal if used in fairly strong doses.

The natural enemies of the European red-mite in New Zealand (Paratetranychus pilosus Can. and Fanz.), W. Cottier (*New Zeal. Jour. Sci. and Technol., 16 (1934), No. 2, pp. 68–80, figs. 7*).—Four predatory enemies of the European red mite said to have been found in New Zealand include a small black lady beetle (*Scymnus* sp.), a midge (*Arthrocnodax* sp.), a gamasid mite, and a trombid mite. It is said that of these only the lady beetle is of importance, and that it appears in sufficiently large numbers too late in the season to be able to cope with the pest.

ANIMAL PRODUCTION

The California apparatus for respiration trials with large animals, M. Kleiber (*Hilgardia [California Sta.], 9 (1935), No. 1, pp. 70, figs. 18*).—This paper discusses the problems involved in the measurement of energy metabolism in large animals, describes the operation of the respiration apparatus at the

branch of the College of Agriculture, Davis, and shows the methods of calculating the results obtained.

[Livestock investigations in Florida] (*Florida Sta. Rpt. 1934, pp. 37–39, 40, 44, 110, 111, 118, 119, 130–133*).—Studies with beef cattle yielded information on calcium deficiency in feeds used in cattle rations, by W. M. Neal and R. B. Becker; the value of grazing for fattening cattle in beef production, by A. L. Shealy; the feeding value of crotalarias, and the efficiency of the trench silo for the preservation of forage crops as measured by chemical means and by the utilization of the nutrients of the silage by cattle, both by Becker, Neal, and Shealy; beef and dual purpose cattle investigations at the Everglades Substation, by R. W. Kidder; and dual purpose cattle research at the West Central Substation.

In swine studies results are reported on comparisons of Spanish peanuts, corn, chufas, and sweetpotatoes with dry-lot feeding for pork production, and fattening fall pigs for spring market, both by W. W. Henley.

With sheep, results were obtained on Columbia sheep performance investigations at the North Florida Substation, by L. O. Gratz.

Poultry studies yielded data at the West Central Substation on the use of peanuts and peanut products in rearing turkeys, confinement v. range rearing of chicks, importance of range rotation in poultry production, all-night lights v. no lights on Single Comb White Leghorn pullets, and the value of milk solids, ground peanut kernels, meat meal, and fish meal in fattening broilers and fryers, all by N. R. Mehrhof, M. W. Emmel, and W. F. Ward.

[Livestock investigations in Indiana] (*Indiana Sta. Rpt. 1934, pp. 21–25, 53–56, 62, 63, 70, 71, figs. 3*).—Information obtained in tests with beef cattle is reported on raising beef calves, the value of adding limestone to rations containing clover hay, soybeans as a supplement for fattening calves, and the carrying capacity and grazing injuries where farm woods are used as a pasture for livestock at Pinney-Purdue Farm.

Tests with swine yielded results on shrinkage of market hogs, price differential between hogs at different markets, roasted soybeans in hog rations, the effect of feeds on quality of pork, comparison of meat and bone scraps and 60 percent tankage as protein supplements, the calcium-phosphorus ratio in rations for swine, and the nutritive value and mineral deficiencies of soybeans and soybean products.

Sheep studies produced results on feeding grain to lambs before grazing is available, pasture for lambs, shearing spring lambs, effect of feeds on the quality of lamb carcasses, a grain ration for supplementing the ewe's milk, and a comparison of types of ewes and crossbreeding in lamb production at the Moses Fell Annex Farm.

With poultry data were obtained in experiments on liquid skim milk and liquid whey for chicks, wheat and oats as substitutes for bran and middlings in the chick ration, soybean oil meal for chicks, reduction of protein in rations for chicks, inheritance of rate of growth in Barred Plymouth Rocks, lighting tests with Barred Plymouth Rock pullets, condensed buttermilk for egg production, feeding grain in troughs to layers, poultry housing, effect of no housing on mature turkeys, hatching turkeys in July for the Christmas market, variations in weight of mature turkeys, and methods of feeding ducks.

[Livestock investigations on the Newlands (Nev.) reclamation project], E. W. Knight (*U. S. Dept. Agr., Tech. Bul. 464 (1935), pp. 29–34, figs. 2*).—Brief reports are given on the progress of investigations with dairy cattle, hogs, sheep, beef cattle, chickens, and turkeys.

[Livestock investigations in New Jersey] (*New Jersey Stas. Rpt. 1934, pp. 4–6, 7, 78, 79, 80*).—Nutrition investigations produced data on the carotene con-

tent of corn silage, the preservation of the carotene content of plant tissues in the laboratory, and feeding highly purified carotene to laboratory animals.

With poultry, results were reported on the vitamin A intake and output of hens confined in individual cages, the tryptophane requirements of the chicken and the role played by this compound in the nutrition of chickens, comparison of cod-liver oil and irradiated ergosterol for preventing leg weakness, the grit requirements of growing chicks, and factors affecting pullet year egg production.

[Experiments with livestock in New Mexico] (*New Mexico Sta. Rpt. 1934, pp. 27–34, 70, figs. 4*).—Results obtained in studies with livestock are reported on the comparative supplemental values of monocalcium phosphate, dicalcium phosphate (anhydrous), and finely ground bone meal when fed to cattle on a deficient calcium and phosphorus range; the phosphorus and calcium content of the important livestock grazing forages in different sections of the State; whether or not dicalcium phosphate when fed to sheep will decrease the death loss of the sheep on pingue areas and of the increase or decrease of pingue on grazed and protected plats; and the value of ground chili powder in the poultry laying ration.

[Livestock investigations in South Dakota] (*South Dakota Sta. Rpt. 1934, pp. 21, 22, 23, 24, 44–46*).—Investigations with swine yielded information on methods of feeding soybeans to avoid soft pork, the value of ground flax in pork production, and fattening fall and summer pigs on ground proso, all by J. W. Wilson.

In poultry tests, results are reported on capon production, the value of white corn and milk in growing turkeys, and turkey egg hatchability, all by W. C. Tully.

Other studies with livestock produced information on the value of ground flax, linseed meal, ground soybeans, and soybean oil meal as supplements to corn and alfalfa hay for fattening baby beef; the influence of the quality of the fleece of Karakul parents on the quality of the offspring's pelt; and methods of curing lamb and mutton, all by Wilson.

[Livestock investigations in Tennessee], M. Jacob (*Tennessee Sta. Rpt. 1933, pp. 29–32*).—Data are reported on the value of molasses in feeding beef cattle, the amount of grain necessary to finish 2-year-old steers on pasture, methods of finishing beef calves, feeding grain to early spring lambs by finishing on pasture, the value of different breeds of rams for producing lambs suitable to Tennessee conditions, the value of different pasture crops for pigs, and the possibilities with temporary and permanent pastures for dairy cows.

The total calcium, phosphorus, and nitrogen content of native and cultivated plants in the high plains of Oklahoma and a study of the mineral deficiencies that may develop in livestock when emergency feeds are fed, H. A. Daniel (*[Oklahoma] Panhandle Sta., Panhandle Bul. 56 (1935), pp. 18*).—The calcium, phosphorus, and nitrogen contents of mature, native, and cultivated plants collected during September and October 1934 from fields and virgin soils in the Panhandle counties of Oklahoma were determined. Similar analyses were made on mature and immature sorghum, with the heads removed from the mature plants.

The results showed that Russian thistles and wild sunflowers were higher in calcium and phosphorus than alfalfa. The native weeds were higher in calcium than grama grass, but prickly pears and sagebrush were lower in phosphorus than this grass. Of the weeds analyzed, Russian thistles were highest in nitrogen and beargrass lowest. Immature sorghum without heads was higher in phosphorus and nitrogen than mature plants with the heads removed, but the latter plants were higher in calcium. The heads were low in calcium and high in phosphorus and nitrogen. Badly burned plants were also high in

calcium and phosphorus. These results were correlated with data secured from areas where mineral deficiencies in forage caused certain diseases and abnormal development of livestock. It is recommended that in order to reduce the possibilities of mineral deficiencies a mixture of forages be fed. When available legumes should be fed with forage sorghum, but when not available wild sunflower and Russian thistle may be used as an emergency feed.

Store animal feed to preserve fats, C. O. WILLITS (*Farm Res.* [*New York State Sta.*], *1* (*1935*), *No. 3, p. 12*).—A study was made of the changes in the fat content of corn meal during storage. When the temperature of the meal was kept at 65° F. or lower there was practically no change in the fat content, even when the moisture content was 14 percent or more. With a moisture content below 8 percent the meal could be stored at 98° without any apparent effect on the crude fiber content. At very low temperatures no loss was encountered regardless of the moisture content of the meal. The enzyme, lipase, present in the corn caused destruction of the fat, especially at the higher temperatures and in the presence of considerable moisture. Molds also destroyed some of the valuable constituents of the feed.

[Maine fishery products], W. F. DOVE (*Maine Sta. Bul. 375* (*1934*), *pp. 218–264, pls. 2, figs. 5*).—A series of experiments with chicks was undertaken to determine the biological value of fish meals. Results showed that Maine white-fish, herring, and sardine meals contained the vitamin D factor that stimulated growth, deposited bone ash, and bone fat, and decreased the amount of food energy required for growth. Fish protein fed as 10 to 12 percent of the ration by weight supplied protection against vitamin D-deficient diseases. Storage for 8 mo. or longer may deprive fish meal of the active vitamin D. Injury due to fire drying or too long a storage period could be corrected by the addition of cod-liver oil. Maine fishery products could effectively replace meat as the sole animal protein of the ration. Meals with the higher fat contents usually tested highest for vitamin D potency when fresh, but after prolonged storage the low-fat meals were most potent in this respect. It was evident that all the fish products contain a protective quantity of vitamin G. The calcium and phosphorus contents of the fishery products, while not complete, were present in greater amounts than in most protein supplements.

In addition to the above experimental results statistical data on the fishery industry, methods of manufacturing fish products, the use of these products as supplements to livestock rations, the effect of mineral and vitamin deficiencies upon livestock and methods of preventing them, and the potential nutritive value of Maine fishery products as a corrective for such deficiencies in livestock are discussed.

Cane molasses (blackstrap) as a livestock feed (*Missouri Sta. Circ. 184* (*1935*), *pp. 4*).—The nature of cane molasses and methods of feeding it to the various classes of farm livestock are discussed.

Out-wintering of cattle, D. G. MUNRO (*Scot. Jour. Agr.*, *17* (*1934*), *No. 3, pp. 269–275*).—In this paper from the North of Scotland College of Agriculture the author discusses a series of trials conducted to determine the best system of wintering store cattle. The results indicated that wintering cattle in a field with a shelter shed was superior economically to other indoor or outdoor methods of management. All the animals were fed turnips and straw during the wintering period. Those that had been wintered in the open made better use of early grass than did the animals that had been more closely confined. It is pointed out that the two greatest drawbacks to wintering outdoors were (1) a dislocation of labor and (2) a loss of farmyard manure.

Wool-growth in sheep as affected by the carbohydrate-content of the diet, A. H. H. Fraser and J. E. Nichols (*Empire Jour. Expt. Agr., 2 (1934), No. 5, pp. 9–19*).—A group of 10 growing sheep was fed a maintenance ration at the Rowett Research Institute, while a similar group received the same ration supplemented with maize (corn) starch. This supplement produced a significant increase in both body weight and gross fleece weight. The latter increase was also reflected in the weight of clean wool. The increase in wool was due to a definite increase in fiber thickness, a slight increase in fiber length, and possibly to an increase in the number of follicles actively elaborating fibers.

The theoretical interpretations and practical applications of the results are discussed.

Some effects of vitamin-A-deficient diets on reproduction of sows, E. H. Hughes (*Jour. Agr. Res.* [U. S.], *49 (1934), No. 10, pp. 943–953, figs. 3*).—The California Experiment Station conducted two investigations over a period of 3 yr. to determine the cause of the failure of reproduction in swine fed barley over long periods and the nutrient or accessory factor which when added to barley would result in reproductiveness.

The following rations fed from the time pigs weighed 40 lb. caused a failure in reproduction: Barley and salt; barley, salt, and calcium carbonate; and barley, salt, calcium carbonate, and casein. Sows of similar weights, age, and breeding did reproduce when fed the basal ration of barley, salt, and calcium carbonate supplemented with either cod-liver oil, chopped alfalfa hay, casein and cod-liver oil, or chopped alfalfa hay, tankage, and linseed meal.

It was evident that barley as the sole source of vitamin A did not contain enough of this factor for normal reproduction. Adding calcium carbonate to a barley and salt diet increased the appetite and rate of gain of pigs. Pigs on a ration of barley, salt, calcium carbonate, and casein had all the outward symptoms of a vitamin A deficiency.

[Experimental work with swine in Hawaii, 1933–34], L. A. Henke (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 9 (1935), pp. 14, 15*).—Results are briefly noted of studies of sprouted oats for sows having breeding troubles and tests of avocados, papayas, and cooked taro scrap for swine.

Phosphorus requirements of laying hens, M. W. Miller and G. E. Bearse (*Washington Sta. Bul. 306 (1934), pp. 20, figs. 4*).—In studies at the Western Washington Experiment Station 8 lots of 60 birds each were fed the same basal ration. In the first 4 lots different amounts of bone meal were added to give 4 levels of phosphorus, while the calcium content was kept at a constant level by reducing the amount of oyster shell. The same levels of phosphorus were fed in the last 4 lots, but a higher level of calcium was maintained.

The highest egg production was obtained on rations analyzing approximately 0.8 percent phosphorus on the 2 levels of calcium intake. Eggshell quality, egg weight, and mortality were apparently not influenced by the phosphorus level. It was possible for hens to utilize the calcium of bone meal for eggshell formation. The eggshell quality of individual birds tended to maintain its relative position with respect to this quality with other individuals throughout the year. There was, however, a progressive decline in shell quality throughout the laying year. High-producing hens tended to lay eggs with thinner, rougher shells than low-producing hens. Thick eggshells tended to be smoother and to have less mottling than thin-shelled eggs.

The relation of sexual maturity and egg weight in the domestic fowl, E. M. Funk (*Jour. Agr. Res.* [U. S.], *49 (1934), No. 11, pp. 1033–1039*).—The Missouri Experiment Station made a study of the relationship between age at sexual maturity and date of sexual maturity and mean weight of first 10 eggs

laid, maximum mean monthly egg weight, and mean annual egg weight of White Leghorn, White Plymouth Rock, and Rhode Island Red pullets.

A significant positive correlation was found between age at sexual maturity and mean weight of the first 10 eggs laid by the Plymouth Rock pullets. Eliminating the influence of body weight at sexual maturity and date of sexual maturity reduced the size of the coefficient of correlation, but it still remained significantly positive. It appeared that young birds did not produce as large eggs at the beginning of the laying period as did older birds of the same body weight. Age at sexual maturity and maximum mean monthly egg weight were not significantly related in the Plymouth Rock pullets. Age at sexual maturity and mean annual egg weight were not significantly related in White Leghorns or in Rhode Island Reds, but were significantly related in Plymouth Rocks. After eliminating the influence of body weight at sexual maturity from this relationship, it was found that age at sexual maturity was related to mean annual egg weight only because it was correlated with body weight. Date of sexual maturity, while definitely associated with the weight of the first eggs produced by Plymouth Rock pullets, did not exert any specific effect on egg size. In Plymouth Rocks and Rhode Island Reds there was no relation between date of sexual maturity and mean annual egg weight. Mean weight of first 10 eggs laid and mean annual egg weight were closely related in Plymouth Rock pullets. Mean weight of first 10 eggs and mean annual egg weight were both related to maximum mean monthly egg weight.

International poultry guide for flock selection, L. F. Payne and H. M. Scott (*Kansas City, Mo.: Internatl. Baby Chick Assoc., 1934, pp. 140+[2], figs. 55*).—This treatise was prepared to furnish a simple guide for hatcherymen, poultry improvement organizations, commercial poultrymen, and farm flock owners in the classification of breeding flocks.

Proceedings of the Fifth World's Poultry Congress [held at Roma, Sept. 6–15, 1933] (*Atti del V. Congresso Mondiale di Pollicoltura, 1933. Roma: Min. Agr. e Foreste, 1934, vols. 1, pp. XX+189, pls. 2, figs. 22; 2, pp. XIV+674, figs. 75; 3, pp. XIV+532, figs. 125; 4, pp. XVII+129*).—The following papers (E. S. R., 64, p. 763) were presented in the various sections, those in the section on hygiene and diseases being noted on page 246.

General report.—Research as to the Origin of Farm Breeds of Fowls, by A. Ghigi (pp. 3–13); The Physiology of Nutrition in the Fowl, by E. Mangold (pp. 14–26); The British Poultry Industry in 1932–33, by P. A. Francis (pp. 27–35); Endocrinology Applied to Aviculture, by E. Baldi (pp. 36–69); The Genealogy of the Breeds of Rabbits, by H. Nachtsheim (pp. 70–79); The Poultry Industry of the United States, by J. A. Hannah (pp. 80–93); Control Measures of Poultry Diseases, by C. Bisanti (pp. 94–100); Preventive Measures against Infectious and Parasitic Diseases of Poultry, by H. Miessner, R. Berge, and R. Wetzel (pp. 101–113); Vitamins in the Development, Reproduction, and Pathology of Birds, by H. Simonnet (pp. 114–148); Methods of Control and Breeding, by L. Weinmiller (pp. 149–155); Proposals for the International Regulation of Egg-laying Trials, by S. Taussig (pp. 156–171); Poultry Statistics, by P. Albertario (pp. 172–185); Training in Poultry Husbandry: The Various Grades, by S. Castelló (pp. 186–195); Government and Private Measures for Increasing Training in Poultry Husbandry, by R. Römer (pp. 196–208); and Development of Rabbit Breeding for Human Food and for the Requirements of the Hat-making and Fur Trades, by F. Maiocco (pp. 209–214).

General and genetic questions.—The Importance of Maintaining Breed Type and Characteristics in Utility Poultry, by C. K. Greenway and W. Hamnett (pp. 217–222); Unexpected Results of Matings Involving Sex-linked Characters, by F. A. E. Crew (pp. 223–226); Observations on the First Generation Cross

between Leghorn Hens and Bankiva Cocks, by F. Wehner (pp. 227–231); Observations on the Hereditary Transmission of Fecundity by a Cock of the Leghorn Breed, by R. Giuliani (pp. 232–236); Research on the Inheritance of Plumage Color in Leghorn Fowls, by M. T. Fattori (pp. 237–245); Poultry Improvement in the Province of Livorno, by E. Bassi (pp. 246–253); Result of an Inquiry among Purchasers of White Leghorn Cocks Selected for Egg Production, by M. Guardasoni (pp. 254–259); On the Value of the Hogan System in the Selection of White Leghorn Hens, by E. Borgioli (pp. 260–265); Statistical Studies on Egg Production of White Leghorns, by Kazunobu Kimura (pp. 266–272); Heredity of Size and Form of the Single Comb in White Leghorns, Rhode Island Reds, and Barnevelders, by J. Axelsson (pp. 273–296); A Comparison of Embryonic Growth Rates of Chickens, Turkeys, Ducks, and Geese, by E. W. Henderson and R. Penquite (pp. 297–306); Poultry Breeding Research in Britain, 1930–1933, by M. S. Pease (pp. 307–313); The Development of the Styrian Fowl, by F. Tritthart (pp. 314–318); The Curly-feathered Fowls of Sicily, by A. Magliano (pp. 319–322); Observations on the Air Chamber in Hens' Eggs, by N. Mihailescu (pp. 323–325); On the Influence of Environment on the Characteristics of Our Domestic Poultry Breeds, by E. Klein (pp. 326–332); The Use of Sex Hormones in Determining the Genotype of Crossbred Fowls, by L. W. Taylor (pp. 333–337); Precipitation Test for the Sexes of Fowl Blood Serum, with Special Reference to Egg Laying, by Kiyotsuna Sasaki (pp. 338–343); The Relation of the Secretory Activity of Different Parts of the Hen's Oviduct to the Inheritance of Weight of Egg, by V. S. Asmundson (pp. 344–348); The Transmission of Laying Qualities, by P. Waroquiez (pp. 349–352); Inheritance of Broodiness in the Domestic Fowl, by E. Roberts and L. E. Card (pp. 353–358); Measurable and Visible Characteristics of the Fowl and Their Correlation with Yield, by R. Küthe (pp. 359–366); Experiments in Crossbreeding Embden and Chinese Geese, by N. Teodoreanu (pp. 367–372); Some Factors Affecting the Length of the Incubation Period, by T. C. Byerly (pp. 373–379); and A Mendelian Study of Six Morphological Characters in an Experiment on Crossbreeding Leghorns and Faverolles, by H. F. Krallinger (pp. 380–393).

Physiology, nutrition, and breeding.—Research Work on the Physiology of Development of the Pattern and the Sexual Dimorphism of Plumage, by G. Montalenti (pp. 397–404); On the Molting and Modifications of the Color and Aspect of the Plumage in Fowls through Feeding Dried Thyroid of the Same Species, by E. Giacomini (pp. 405–409); Some Factors Influencing Gonad, Comb, and Wattle Development of the Chicken, by G. D. Buckner, J. H. Martin, and W. M. Insko, Jr. (pp. 410–415); Spontaneous Sex Reversal in Domestic Ducks, by F. Caridroit (pp. 416–420); Relation between Egg Production and the Activity of the Pituitary Gland in Hens, by C. Colombi (pp. 421–425); Influence of Ultraviolet Rays on the Growth and Health of Chicks, by A. Pirocchi (pp. 426–438); Experiment with the Extirpation of the Bursa Fabricii in *Gallus domesticus*, by A. Taibel (pp. 439–443); Researches on the Changes in Lime Content between the Various Parts of the Hen's Egg during Incubation, by A. Cazzaniga (pp. 444–449); Preliminary Note on the Interruption of Development Produced by the Action of Low Temperatures during the Incubation of Hens' Eggs, by L. Kaufman (pp. 450–452); The Sunshine Factor in Hatchability, by J. B. Smith (pp. 453–461); Investigations on Changes in the Laid Egg, by P. Ulrik and D. Davidsen (pp. 462–474); Ovulation in the Fowl, by Seigo Shibata (pp. 475–478); The Nature of Variations in the Egg Weights of the Domestic Fowl, by D. Philpott (pp. 479–490); Oyster Shells and Limestone Grit in Poultry Feeding, by G. Giusti (pp. 491–501); Experiments in Feeding Poultry with Various Mineral Substances, by A. Vecchi (pp. 502–511);

The Vitamin-G Requirement of Poultry, by L. C. Norris, G. F. Heuser, A. T. Ringrose, H. S. Wilgus, Jr., and V. Heiman (pp. 512–520); The Quantities of Vitamin A Required by Pullets for Maintenance and Egg Production, by R. M. Sherwood and G. S. Fraps (pp. 521–525) (E. S. R., 71, p. 686); Cod-liver Oil and Artificially Prepared Vitamin D as Components of Chicken Feed, by P. Ubbels (pp. 526–536); The Theoretical and Practical Bases for the Calculation of Rations for the Laying Hen, by G. Von Wendt (pp. 537–540); Studies of the Essential Nutritive Properties of Common Protein Supplements Used in Poultry Rations, by H. S. Wilgus, Jr., R. C. Ringrose, and L. C. Norris (pp. 541–546); Effect of Feeding Vegetable Protein on Copulation and Fertilization in the Fowl, by Tadashi Hatano (pp. 547–550); The Influence of the Protein Level on the Growth of Chickens and Its Relation to Subsequent Behavior, by G. F. Heuser and L. C. Norris (pp. 551–558); Crude Fiber and Protein in the Rations of Laying Hens, by R. Fangauf (pp. 559–566); Optimum Protein Levels for Chickens, by J. L. St. John, J. S. Carver, O. Johnson, and D. Brazie (pp. 567–574); The Role of Cereal Grains in Avian Nutrition, by H. D. Branion (pp. 575–580); The Biological Value of the Egg, by G. Tallarico (pp. 581–586); On the Formation of the Hen's Egg with Especial Reference to the White, by C. H. Hansen (pp. 587–593); Some Calculations as to the Variability of Egg Production in Hens, by I. G. Tukker (pp. 594–604); Basal Metabolism in Different Breeds of Fowls, by G. Nichita (pp. 605–611); Some Aspects of Fat Metabolism in Fowls and Their Practical Significance, by E. T. Halnan and E. M. Cruickshank (pp. 612–619); The Cholesterol Content in the Blood of the Hen, by Yoshio Kaishio (pp. 620–624); Variation in the Leucocyte Formula Following on Castration of Cocks, by A. Magliana (pp. 625, 626); Correlations between the Beginning of the Laying Period and the Weight and Number of the Eggs, by M. Righi (pp. 627–633); Scale for Establishing the Color of the Egg Yolk of Poultry—Modifications of Yolk Color from Additions of Food Supplements, by D. W. Kupsch (pp. 634–640); Variation in the Composition of Wheat By-products, by T. J. Shaw (pp. 641–646); Abstract of Barley vs. Corn Research, 1931–1932, by M. C. Herner, A. D. Robinson, and C. H. Whidden (pp. 647–650); Fish Meals and Their Utilization as Poultry Food, by C. Maldura (pp. 651–657); The Value of Liver Meal for Poultry Nutrition, by A. D. Holmes, M. G. Pigott, and P. A. Campbell (pp. 658–663); Effect of Modifying the Calcium-Phosphorus Ratio of a Specific Ration for Growing Turkeys, by F. E. Mussehl and C. W. Ackerson (pp. 664–667) (E. S. R., 68, p. 802); and The Chemical Composition and Morphological Constituents of the So-called Crop Milk of Pigeons, by F. Dulzetto and N. Li Volsi (pp. 668–674).

Instruction and organization.—The Development and Importance of Poultry Breeding in the Netherlands, by D. S. Huizinga (pp. 229–239); The Progress of Poultry Keeping in Bulgaria during the Last Five Years, by G. S. Chlebaroff (pp. 240–247); The Poultry Industry in Algeria, by J. Bernard (pp. 248–257); The Organization of a State-wide Extension Program, by H. E. Botsford (pp. 258–262); A State-wide Poultry Improvement Program, by G. S. Vickers (pp. 263–268); Recent Progress in Egg Laying Capacity of Poultry in Japan (pp. 269–272); Form and Scope of the Present Organization of the Poultry Industry in Germany, by T. Schultz (pp. 273–278); Organization for the Encouragement of Pedigree Poultry Breeding in Germany, by O. Höpping (pp. 279–287); The Organization of Poultry Husbandry in Belgium, by V. Pulinckx (pp. 288, 289); Women's Activities in Poultry Farming and the Propaganda Carried on by the National Union of Country Housewives, by A. Cernezzi-Moretti (pp. 290–295); The Use of Visual Education in Extension Work, by

C. M. Ferguson (pp. 296–301); The Advisory Service for Poultry Breeders and Its Success, by B. Schlössingk (pp. 302–307); Value for Breeding Purposes of the Native Bulgarian Poultry, by G. S. Chlebaroff (pp. 308–322); Five Years of Organized Promotion of Farm Poultry Raising by State and Voluntary Methods, by S. Mühlberg (pp. 323–328); A Review of the Grow Better Chicks Campaign—Progress and Results, by R. E. Jones (pp. 329–332); The Activity of Poultry Breeders' Societies in the Netherlands, by P. J. van Haaren (pp. 333–341); The Herd-Book Societies, by A. von Burgsdorff (pp. 342–345); Observations on Trap Nests, by F. Clementi (pp. 346–355); Record of Performance in United States, by O. E. Shear (pp. 356–363); and Syndical Organization of Poultry Breeders in Italy, by R. Rinaldi-Ceroni (pp. 364–367).

Economic problems and trade in poultry products.—Considerations on the causes of alteration and deterioration of eggs, by C. H. Pérard (pp. 371–383); Control of the Freshness of Eggs by Measurement of Their pH, by C. Voitellier, M. Goyat, and E. Devaux (pp. 384–395); Commercial Methods of Shell Treating of Eggs with Oil in the United States, by J. Lawler (pp. 396–399); Reaction of the Frozen and Dried Egg Industry of the United States to the Present Economic Depression, by A. D. Greenlee (pp. 400–402); Loss of Weight of Eggs Held in Cold Storage, by M. E. Pennington (pp. 403–410); Experiments in the Organization of Cooperative Marketing of Eggs, by F. Skaller (pp. 411–417); The Marking of Eggs and Its Influence on the Poultry Industry, by F. Mannes (pp. 418–422); The Cost of the Fowl from Incubation to the Age of Three Months in the Experimental Poultry Farm of the Royal Higher Agricultural Institute of Milan, by G. Giusti (pp. 423–432); A Comparative Study of the Bases of the Poultry Industry in Various Countries, by W. Rieth (pp. 433–439); Propaganda in Favor of Poultry Products—A Poultry Problem of World Interest, by F. Pfenningstorff (pp. 440–445); The Changing Status of Trade and the Opportunity It Offers for More Effective Merchandising of Eggs and Poultry in Canada, by C. Henderson (pp. 446–455); Profits of Poultry Raising in the Small Farms of Rumania, by J. Braghina (pp. 456–458); The Utilization of Poultry Products in Switzerland, and Its Influence on Importation of Eggs and Table Poultry, by K. Kleb (pp. 459–462); Government Inspection and Government Grading of Poultry and Eggs in the United States of America, by R. C. Potts (pp. 463–471); Commercial Grading and Marketing of Turkeys in the United States in Accordance with Government Grades, by T. W. Heitz (pp. 472–478); The Conduct of a Poultry Products Marketing Program in Iowa, by W. D. Termohlen (pp. 479–484); Egg and Poultry Auctions in the United States, by A. E. Jones (pp. 485–491); and Quick-Frozen Poultry in the United States of America, by C. Birdseye (pp. 492–497).

Rabbit raising.—The Numbers of Chromosomes in the Rabbit, by C. Ragionieri (pp. 501, 502); Blue Dutch—A New Linkage in Rabbits? by M. S. Pease (p. 503); The Influence of the Ripening of the Ovules on Sex Determination, by C. Voitellier (pp. 504–508); Cases of Abortion in the Angora Rabbit, by C. Bidone (pp. 509–512); Numerical Variations of the Pigments in the Blood of Young Rabbits Fed Rations Containing Irradiant Principles, by A. Magliano (pp. 513, 514); Skin and Hair of the Angora Rabbit, by E. Tänzer (pp. 515–517); Observations on the Different Methods of Treatment of Coryza, by C. Ragionieri (pp. 518–522); Methods Employed in Belgium for the Promotion and Encouragement of Practical Rabbit Breeding (pp. 523, 524) and The Uniformity of the Types and Varieties of Belgian Rabbit Breeds (p. 525), both by H. Monier-Tilmanne; and Recent Results on the Hereditary Syringomyelia of Rabbits, by B. Ostertag (pp. 526–532).

Résumés of these papers are in English in volume 4.

DAIRY FARMING—DAIRYING

[Experimental work with dairy cattle in Hawaii, 1933–34], G. W. H. Goo and L. A. Henke (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 9 (1935), pp. 4–13*).—Brief reports are given of the progress of experimental work, including results of agglutination abortion tests, value of alfalfa hay as a supplement to green roughages, green panicum v. green Sudan grass, shredded and cut pineapple plants as roughage for dairy heifers, raw sugar as a supplement to rations fed to milking cows, liver fluke control in Hawaii, and sprouted oats for breeding trouble.

[Experiments with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1934, pp. 28, 29, 31, 56, 57, 63, fig. 1*).—Experiments with dairy cattle led to information reported on supplementing legume hay with protein concentrates, and the influence of enzyme action and sunlight on the vitamin A value of alfalfa hay during the curing process.

With dairy products results were obtained on the influence upon the vitamin A value of butter from cows fed alfalfa hay and soybean hay cut at different stages of maturity, the effect of storage upon the vitamin A value of butter, the lecithin content of milk and its products, the enzymes in sweet and sour farm skimmed cream as related to the keeping qualities of butter, the cause and remedies of some abnormal flavors in milk with special reference to cappy flavor, methods used in washing and sterilizing milking machines, effect of pH concentration and season of the year upon the keeping qualities of butter as manufactured under commercial conditions, the producers' method of disposing of milk and dairy products and returns secured, milk quality improvement, the vitamin A value of different butters as affected by the relative proportions of carotene and vitamin A, and vitamin A activity, carotene content, and antioxidants of butterfat.

[Experiments with dairy cattle and dairy products in New Jersey] (*New Jersey Stas. Rpt. 1934, pp. 4, 6, 31–34, 35–37*).—Experiments with dairy cattle yielded information on the stability of vitamin A in stored machine-dried alfalfa hay, a complete dairy ration made up of a mixture of artificially dried forage crops, inbreeding and outcrossing to establish genetic factors for high milk and fat production in Holsteins and high color in the milk of Guernseys, artificial dehydration of roughages, effect of nitrogen fertilization on the carrying capacities of pastures, effect of feeding colloidal iodine to dairy cattle, palatability and keeping qualities of coconut and palm kernel meals, and comparative feeding trials using dehydrated hay alone v. dehydrated hay and peanut husks for wintering heifers.

Results obtained in studies with dairy products are given on the effects of certain triglycerides and fatty acids on the processing of ice cream, churning of butter, and whipping of cream; the use of lye solution as an antiseptic for the rubber parts of milking machines; the efficiency of steam v. sodium hypochlorite sterilization of utensils; and causes of fat test variations in weigh tanks at creameries.

[Dairy cattle and dairy products investigations in South Dakota], T. M. Olson (*South Dakota Sta. Rpt. 1934, pp. 29, 30–33*).—Dairy cattle studies produced data on a comparison of sweetclover, alfalfa, rye, and Sudan grass pasture under South Dakota conditions; variations in calcium and phosphorus content of cows' milk during the lactation period; Russian thistle silage, including analyses; crossbreeding; and the effect of lack of direct sunlight on production and reproduction of dairy cows.

With dairy products, information was obtained on ice wells for storing milk, vitamin D potency of winter and summer butter, minimum milk requirements to

protect against rickets, and whether vitamin D was associated with the fat or serum of milk.

Pasture fertilization results, R. H. Lush and J. L. Fletcher (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 733–735*).—Studies at the Louisiana Experiment Station, carried on at the Southwestern Louisiana Institute dairy farm, showed that pasture vegetation in this region responded quickly and profitably to nitrate, superphosphate, and cyanamide applications. The response to liming was much slower, and there was no response to the use of potash and ammonium sulfate fertilizers. The response to fertilization took the form of greater growth rather than a change in composition. However, there was a large seasonal difference in protein and yield with regard to cutting time. On the nitrate- and superphosphate-treated pastures milk production doubled, and on the cyanamide pasture trebled as compared with that produced on the unfertilized plats. The soil reaction was not adversely affected by proper fertilization

Studies with alfalfa hay for milk production, I. R. Jones, P. M. Brandt, and J. R. Haag (*Oregon Sta. Bul. 328 (1934), pp. 30, fig. 1*).—The results of long-time feeding trials for milk production with second-cutting alfalfa hay, fed as long hay, chopped hay, and long hay with grain are reported.

The average cow in the long-hay group, largely mature animals, weighed 985 lb., consumd 9,031 lb. of alfalfa hay, 126 lb. of long oats and vetch hay, and 189 lb. of concentrates, produced 4,421 lb. of milk and 166.2 lb. of butterfat in 305 days, and calved again in 13 mo. In the chopped-hay group the average animal weighed 1,045 lb., consumed 8,960 lb. of alfalfa hay, 863 lb. of chopped red clover hay, and 76 lb. of concentrates, produced 5,696 lb. of milk and 214 lb. of butterfat, and calved again in 15 mo. In the hay-grain group, all immature animals, the average cow weighed 888 lb., ate 5,664 lb. of alfalfa hay, 2,060 lb. of ground barley, and 1,030 lb. of ground oats, produced 7,208 lb. of milk and 277.9 lb. of butterfat, and calved again in 14.5 mo. On the basis of mature equivalent 4 percent corrected milk, the average production in the respective groups was 4,464, 5,778, and 8,416 lb.

The low production on alfalfa alone was due apparently to the relatively low consumption of total digestible nutrients and probably of phosphorus. Cows receiving grain were 7 percent more efficient in converting feed total digestible nutrients into milk total digestible nutrients than those on hay alone. Cows could consume about 30 lb. daily per 1,000 lb. of live weight of alfalfa hay when it made up the entire ration. The cows fed alfalfa hay almost exclusively for 5 yr. reproduced fairly normally. When butterfat sold for 30 ct. per pound or more it was economical to chop alfalfa hay at a cost of $2.25 per ton regardless of the cost of the hay. With concentrates at $20 per ton and alfalfa at $15 per ton or less it was economical to feed grain with alfalfa hay, but with grain at $30 per ton and hay at $10 per ton it was only economical to feed grain when butterfat sold at 30 ct. or more per pound.

The effect of alfalfa hay on milk flavor, E. Weaver, A. H. Kuhlman, and E. L. Fouts (*Jour. Dairy Sci., 18 (1935), No. 1, pp. 55–61, figs. 2*).—The Oklahoma Experiment Station conducted a trial with 12 cows to determine the effect upon milk flavor of varying quantities of alfalfa hay fed at varying time intervals before milking. All the cows were fed alfalfa hay and a concentrate mixture, some received no succulent feed, while others were given mangels or darso silage.

When fed less than 4 hr. before milking alfalfa hay had a pronounced effect on milk flavor. Even when the interval between feeding and milking was only 30 min. the flavor was affected, but the 2-hr. interval caused the most serious flavor defect in milk. With some cows the flavor of the hay was entirely eliminated by milking time if the hay was fed 4 hr. before, while with others

it was reduced to a point where it was scarcely discernible. It is recommended that the hay be fed either after milking or at such an interval before milking that the flavor will not be affected. The intensity of the hay flavor in the milk increased with the amount of hay fed to the cow. Holstein milk was less subject to the hay flavor than Jersey milk. Aeration removed some of the feed flavor, but cooling was ineffective in this respect. The effect of alfalfa hay on milk flavor was more serious than that of darso silage.

Cane molasses as a feed for dairy cows, L. A. Henke (*Hawaii Sta. Bul. 73 (1934), pp. 17*).—The results obtained in a long-time experiment involving the feeding of cane molasses to individual cows over a period of 7 consecutive years to determine the cumulative effects, if any, on milk production and breeding efficiency and of two short tests of 15 weeks each to determine the effects on production are reported.

In the long-time test the feeding of molasses neither increased nor decreased milk production, but did slightly increase fat production as compared with the check group. There were no increases in numbers of abortions or any significant decrease in reproductive efficiency as a result of molasses feeding.

The short-time tests showed that cows fed molasses averaged 1 lb. heavier per head than those on the check ration. The fat content of the milk averaged 3.6 percent, and the average daily milk production was 2.5 lb. for the two rations. When molasses was valued at $10 per ton the feeding of 25 percent molasses in the concentrate ration reduced feed cost about 14 percent, and where it was considered gratis on the plantations the savings in feed cost were about 29 percent.

Derangement of the digestive processes in the milk-fed calf due to abnormal curd formation in the fourth stomach, E. J. Sherry (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1934), No. 9, pp. 73–85, figs. 5*).—The reasons for the disturbances of the alimentary system of pail-fed calves were studied for a period of 5 yr., using a total of 145 calves. The symptoms of these disturbances were lack of appetite, lassitude, and diarrhea, and the condition resulted in a severe setback and often ended fatally.

Post-mortem examination located the seat of the disturbance in the fourth stomach, where the accumulation of dense cheesy curd caused irritation and congestion of the stomach linings and sometimes rupture of the blood vessels. This condition was due to the inability of the pepsin of the stomach of affected animals to digest, in the interval between feedings, the clot produced by the action of rennin on the milk. Diluting the milk with water was highly successful as a preventive and remedy for the condition. Withholding milk and feeding water only for a day, followed by feeding diluted milk, resulted in the disappearance of the accumulated curd. Calves fed freshly drawn unadulterated milk showed practically no digestive disturbance. Observations indicated that pasteurized milk caused less stomach trouble than raw milk fed in like quantities.

The differences in the type of curd formed by milk drawn at different stages of lactation, by milk diluted with water, by the colostral milk of the cow, and by milk from different species of mammals are discussed.

Birth-weight, gestation period, and sex ratio of Alaskan hybrid Holstein-Galloway calves, W. T. White (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 709–716, figs. 3*).—The data reported in this paper were obtained on the Holstein-Galloway cattle of the Alaska Experiment Station during the period 1917–32.

The average gestation period for the 116 hybrid calves was 282.9 days, with no significant difference in the gestation period of male and female calves. The average birth weight of 52 male calves was 91 lb. and of 57

females 87.9 lb. The proportion of sexes for all the calves was 61 females to 55 males, which was not statistically significant.

The secretion of milk and the milking process, C. W. TURNER (*Missouri Sta. Bul. 346 (1935), pp. 19, figs. 5*).—Continuing the study of the mammary system of the cow (E. S. R., 72, p. 832), the following conclusions as to the mode of milk secretion, based on a mass of direct and indirect evidence, are presented.

Milk is largely made from certain constituents taken from the blood by the epithelial cells lining the alveoli of the udder, but certain minor constituents may pass directly from the blood into the milk. Within these cells there is a period of synthesis during which milk is formed, followed by a discharge of the milk into the cavity of the alveolus. Following milking these cycles of secretion and discharge are rapid, filling the lumina of the alveoli, the ducts and storage spaces of the duct system, and the gland cistern. During this period there is little change in the size of the udder, but with continued secretion and discharge of milk there is a gradual rise in udder pressure. The cycles of secretion and discharge slow down due to the increasing milk pressure on the blood capillaries, reducing the flow of blood, and to the greater difficulty in discharging the cell's content into the lumen. It is also thought that the pressure prevents the rupture of the cells and that the contents are discharged only through the semipermeable cell membrane. Since the milk fat cannot leave the cell when the pressure is high, the fat content of the milk secreted at this period is low. If milk is allowed to accumulate in the udder for a long time the pressure practically inhibits both the secretion and excretion of milk.

Evidence indicates that at the beginning of the milking act the massage of the teats or the operation of the milking machine stimulates an increase in the pressure in the udder. This increase is due to the contraction of smooth muscles lining the ducts of the udder. Milk is removed with the greatest ease and completeness while the pressure is maintained, and if the milk is not completely removed by the time the muscles relax it becomes unavailable to the milker. Excitement at milking time interferes with the stimulation of the udder so that the pressure is not increased and milking is difficult.

A study of the data of milk yields of various types of cattle obtained from the records of Government Military Dairy Farms, I, II, K. P. R. KARTHA (*Indian Jour. Vet. Sci. and Anim. Husb., 4 (1934), Nos. 1, pp. 36–62, figs. 7; 2, pp. 124–147, figs. 6*).—The milk records of the herds maintained at the Government Military Dairy Farms in India under fairly good conditions of feeding and management were examined.

I. *Rate of decline in milk yield with advance in lactation.*—An examination of 498 milk records showed that the rate of decline in milk yield was lowest in pedigreed Sahiwal and highest in ordinary Sahiwal cows. The rate of decline for the crossbred cows and buffaloes was intermediate between the above limits. While the maximum rate of secretion was attained at different stages of lactation with different individuals, the average was between the third and sixth week after calving. Aside from minor variations, the yield for any month bore a constant ratio to that of the preceding month. A table is appended showing the importance of the rate of decline as a factor in economical production.

II. *Persistency of lactation and its relation to age and level of production.*—In this phase of the study the values of the rate of decline were found to lie within a range of 1 to 20 percent per month for 812 lactations. The average rate of decline varied from 8.6 percent for the pedigreed Sahiwal to 11.7 percent for the ordinary Sahiwal, with the crossbred and buffalo showing 9.2 and 9.7 percent, respectively. The rate of decline increased with a rise in the

level of production. There was a definite increase in the rate of decline from the first to the second lactation, less marked from the second to the third, after which the curves tended to be flat. The mean persistency for each group followed somewhat irregularly but rather closely the mean rates of yield for the group, indicating that persistency was more influenced by level of production than by age. Appended are methods for determining the maximum rate of yield and the rate of decline.

Progress report on comparison of lactation and yearly records, G. M. Harris, J. L. Lush, and E. N. Shultz (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 737–742*).—At the Iowa Experiment Station the production records from 35 herds, including more than 1,800 lactation records made by 552 cows, and approximately the same number of cow-testing association yearly records made by the same cows, were studied to determine which of the two kinds of records was the more accurate.

It is concluded that the cow-testing association yearly record tended to repeat itself in succeeding years about as closely as did the lactation record. On this basis a general change to the lactation basis for selecting dairy cows, proving dairy sires, etc., would not lead to any material increase in accuracy. It is pointed out that an important factor in considering records are the conditions under which the records are made and that allowance should be made for them wherever possible.

The influence of the stage of lactation on fat estimations by the Gerber method, J. Lyons and M. O'Shea (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1934), No. 12, pp. 123–131, figs. 2*).—Studies indicated that the underestimation of fat percentages which occur toward the end of lactation, when tests are whirled for only one 3-min. period, have no great significance in creamery practice. The fraction of fat not estimated consisted of very small globules which would be lost in the manufacturing process.

The loss was of greater significance in cow testing, particularly in the case of cows barely able to produce the butterfat necessary for registration. The loss with the ordinary Gerber test bottles whirled for a 3-min. period has been estimated as 1.25 lb. of butterfat for a 45-week period, but according to more accurate results obtained with "precision" test bottles the loss was 4.25 lb. In the case of cows that normally produced a high proportion of small fat globules, the error may be even greater.

Electrokinetics in relation to dairy phenomena.—I, Theory and method, G. C. North and H. H. Sommer (*Jour. Dairy Sci., 18 (1935), No. 1, pp. 21–43, figs. 7*).—Investigations were carried out at the Wisconsin Experiment Station to determine whether the electrical effects at the fat-skim milk interface were the governing factor, or at least one of the important factors, in the behavior of milk fat globules under various conditions.

A method is described, based on the theory of streaming potentials, that may be used in measuring the magnitude of the electric charge at the fat-serum interface. The stability of the colloidal systems is discussed and a mathematical development of the streaming potential formula given. Data are presented to show that an interface quite comparable to that of the fat globule as it exists in milk was being considered.

The electrokinetic potentials of various samples of milk from individual cows varied over a comparatively wide range. The isoelectric point of the interface was found to be about pH 4.3. Adding increasing amounts of potassium chloride caused an increase that was later followed by a decrease in potential. Chlorides of calcium, iron, and thorium decreased the potential, with the latter salt being the most effective and at certain concentrations re-

versing the sign of the charge. Dicalcium phosphate and sodium citrate caused the potential to become strongly negative, and the latter salt was the most effective in this respect. Increased temperatures gave a pronounced increase in observed electrokinetic potential.

Investigations of the cryoscopy of milk, J. J. RYAN and G. T. PYNE (*Roy. Dublin Soc. Sci. Proc., n. ser., 21 (1934), No. 11, pp. 113–122*).—In studies at University College, Cork, a cryoscopic constant was developed that took account of the major osmotic constituents of milk, namely, lactose, chloride, and phosphate. The methods for the various analytical determinations required for this constant are discussed.

Preliminary work on the relation of the proposed constant to the freezing point of fresh milk, mixed, individual samples, and samples of low specific gravity, showed the correspondence between the two to be very close. The determination of the constant in the case of milk to which known amounts of water had been added resulted in a close check on the degree of dilution. It is suggested that this estimation may be more definite than that of freezing point determination, particularly where refractive index is used as a routine method.

New apparatus for determining curd character of milk, A. P. COLE (*Milk Plant Mo., 24 (1935), No. 1, pp. 24, 25, figs. 2*).—In this article from the Michigan Experiment Station the author describes a new apparatus for determining the curd character of milk. With this equipment the speed of the knife through the coagulated milk is controlled by mechanical means and accurate samples are obtained.

Soft-curd milk, F. J. DOAN and R. C. WELCH (*Pennsylvania Sta. Bul. 312 (1934), pp. 35, figs. 12*).—The results of a series of investigations are reported.

I. *The composition and physicochemical characteristics of soft-curd milk as compared with hard-curd milk.*—In this phase of the study curd tension of normal milk was found to be a linear function of the casein content. Other ingredients of milk and other milk characteristics appeared to have little effect on curd tension, although ash content, calcium content, titratable acidity, and buffer capacity seemed to be related incidentally.

II. *Factors affecting curd tension and the production of soft-curd milk by natural and artificial means.*—Curd tension was found to be an individual characteristic of cows' milk, which was apparently persistent from one lactation to another. The curd tension of herd milk was lower in early summer and higher in early winter than the yearly average. The curd tension was also highest during the first month or 6 weeks of lactation, lowest in the second month, and gradually increased to a second high near the end of the period. At the extreme end of lactation curd tension may abruptly fall to 0. Individual animals showed daily variations in curd tension, and variations also occurred during oestrous periods but these were not uniform. Dilutions with water up to 30 to 40 percent reduced curd tension in proportion to the reduction in casein content, but beyond this point there was little change. Heating lowered curd tension to some extent, but the holding method of pasteurization had little effect. Heating often increased the curd tension of milk of high fat content due to the destruction of the fat-clustering tendency. Homogenization and the addition of alkalies reduced curd tension. Up to a certain point the addition of acids increased curd tension, but in larger amounts the tension was decreased due to the formation of some precoagulated acid casein which was not affected by the coagulating enzyme. The maximum curd tension obtainable could be determined by the use of pepsin hydrochloric acid mixtures when the pH of the serum is between 6 and 6.1, the same pH found

in the stomach. Calcium precipitation destroyed the coagulating ability of the milk with pepsin, but this property was restored by hydrochloric acid at a pH not under 6.

III. *Mastitis and soft-curd milk*.—The results of this phase of the study have been previously noted (E. S. R., 71, p. 94).

IV. *The comparative digestibility of soft-curd and hard-curd milk*.—Soft-curd milk was apparently more rapidly digested and eliminated sooner than hard-curd milk from the stomach of humans, calves, and rats. The curds formed from milk of low tension were more friable and looser than those from milk of high tension. Calves fed soft-curd milk gained less in body weight than those fed hard-curd milk in equal amounts. Studies in vitro showed that while the break-down of curds of both types of milk during gastric digestion were slow at the higher pH levels, soft-curd milk is acted on more rapidly than hard-curd milk. At lower pH values both types of milk were more vigorously disintegrated. Soft-curd milk apparently exposed a greater surface per unit of protein to digestive juices than did hard-curd milk, but the latter was not easily disintegrated by agitation or peristalsis. A new method of studying gastric digestion of milk in vitro is described.

X-ray investigation of the microcrystalline structure of butter-fat, W. VAN DAM and W. G. BURGERS (*Jour. Dairy Sci., 18 (1935), No. 1, pp. 45–50, figs. 5*).—The results of three experiments carried out at the Agricultural Experiment Station, Hoorn, Netherlands, on the crystalline structure of butterfat are reported. Comparisons were made of crystallized butterfat and of butter, of the influence of keeping butter at low temperature on its crystallization, and of the influence of wash water of very low temperature as compared with that of normal temperature on the crystallization of butter.

Microphotographs showed distinctly the presence of liquid fat as well as solid fat in butter. In butter kept for a long time at low temperature a strong crystallization of solid butter fat took place, and the "oil ring" which was apparent in the same butter before storing almost completely disappeared. There was no marked difference in the photographs of the butter washed either in cold or in normal temperature water. This was true in both the fresh condition and after 1 week's storage at 8° C. The authors, however, do not believe that the latter pictures show the true conditions of the two butters.

Studies on acetylmethylcarbinol and diacetyl in dairy products, M. B. MICHAELIAN and B. W. HAMMER (*Iowa Sta. Res. Bul. 179 (1935), pp. 201–231*).—Investigations were undertaken to determine the comparative amounts of acetylmethyl carbinol and diacetyl in cream and in buttermilk or butter obtained from it, and the general action of citric acid-fermenting streptococci from butter cultures in the production of this product and of volatile acid.

Fresh buttermilk regularly contained larger quantities of acetylmethyl carbinol plus diacetyl than the cream from which it came. The ratios of the product in cream to the amounts in buttermilk in seven commercial churnings varied from 1:2 to 1:3.1, while in six series of experimental churnings, each series involving a number of lots of cream of different acidities, the ratios varied from 1:1.1 to 1:2.1. Butter contained less of the product than the cream from which it was churned. With 52 small churnings of butter, which were salted and made with butter culture, the ratios of the product in cream to the amounts in the butter varied from 1:0.032 to 1:0.218. The amount of the product in butter serum was always larger than the amount in the fat from the same butter. Cream delivered to butter plants often contained this product, and in general it was present in greater amounts in sour than in sweet cream.

Milk cultures of citric acid-fermenting streptococci that had been killed with heat, formalin, or chloroform did not produce acetylmethyl carbinol plus diacetyl when treated with 0.15 percent citric acid and 0.3 percent sulfuric acid. Suspension of the organisms washed from whey agar plates with sterile water and killed with chloroform produced none of the product when added to milk containing 0.5 percent citric acid. A rather close relationship was found between the numbers of streptococci added to milk having a low pH and the amounts of the usual fermentation products formed. In milk to which citric acid had been added relatively large amounts of acetylmethyl carbinol plus diacetyl were produced by the citric acid-fermenting streptococci, but only a relatively small percentage of the added citric acid could be replaced as acetylmethyl carbinol plus diacetyl. Volatile acid production in milk cultures of the citric acid-fermenting streptoccocci was not increased by the addition of diacetyl, acetylmethyl carbinol, or 2.3 butylene glycol, indicating that when acetylmethyl carbinol plus diacetyl disappears in a culture these materials are not changed to volatile acid.

Certain foam producing substances of milk, S. Ansbacher, G. E. Flanigan, and G. C. Supplee (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 723–731*).—In this paper (E. S. R., 72, p. 525) the authors present various data and observations which tend to show that the particular group of substances contributing to the foaming ability of milk are contained in the group of milk constituents commonly designated as the "nitrogenous extractives." These substances are physically associated with other milk constituents, particularly the proteins. It is pointed out that the physicochemical properties of the highly dispersed and unstable colloids contributing to the foaming property of milk and to the character of the foam are undoubtedly responsible for many other physical characteristics and reactions of milk and its derivatives.

Color of milk, H. H. Tucker and K. O. Pfau (*Guernsey Breeders Jour., 47 (1935), No. 3, pp. 116, 117, 146, 147, figs. 3*).—Studies at the New Jersey Experiment Stations showed that feed was the most important factor influencing the color of milk. Good quality dehydrated hay was about equal to good mixed pasture, while alfalfa pasture was superior to both grassland and mixed clover pasture and slightly superior to dehydrated hay in the production of milk with high color. Bleached or low-colored roughages decreased the color of milk. Seasonal variations in color may be explained on the basis of the rations fed. Milk produced in the evening was significantly higher in color and butterfat percentage than morning milk. There was a direct relationship between butterfat content and color. Holstein and Guernsey milk varied in butterfat percentage and color in the same ratio.

A chart to aid in scoring milk flavor, E. L. Fouts and E. Weaver (*Jour. Dairy Sci., 18 (1935), No. 1, pp. 51–54*).—In this paper from the Oklahoma Experiment Station the authors present a proposed chart for scoring milk flavor. The observed benefits that occurred during the scoring of about 1,000 samples of milk by five or six judges using this score card are presented.

Farming along the Mediterranean Sea.—III, The fluid milk industry in Italy, R. S. Breed (*Farm Res. [New York State Sta.], 1 (1935), No. 3, p. 10, figs. 2*).—This descriptive article continues the series previously noted (E. S. R., 72, p. 680).

Methods for testing frozen cream, H. C. Trelogan and W. B. Combs (*Jour. Dairy Sci., 17 (1934), No. 11, pp. 717–722*).—In the absence of an accurate, dependable method for sampling and testing frozen cream, the Minnesota Experiment Station studied the reliability of two methods by testing 36 cans of such cream and making a statistical analysis of the results. The "frozen" test, in

which frozen chips of cream from the top of the can were weighed directly into the test bottle, gave results which indicated that the average of six duplicate analyses was reliable within 0.5 percent of the test of the original cream. The melted test, obtained after melting chips of frozen cream, gave results that were reliable within 1 percent of the test of the original cream. On the basis of these results the frozen test is recommended for determining the butterfat content of frozen cream.

Variations in the quality of butter, particularly in relation to the vitamin A, carotene, and xanthophyll content as influenced by feeding artificially dried grass to stall-fed cattle, A. E. Gillam, I. M. Heilbron, R. A. Morton, G. Bishop, and J. C. Drummond (*Biochem. Jour.*, *27 (1933), No. 3, pp. 878–888, figs. 5*).—Four groups of cows were fed at University College, London, to determine the effects of two types of artificially dried grass and of grass silage on the quality of milk and butter as compared with that produced on a normal winter ration. The values for carotene, xanthophyll, and vitamin A of the butter were determined spectroscopically.

On an ordinary winter ration of hay and concentrates the values for carotene, xanthophyll, and vitamin A of butter fell steadily during the winter and remained at a very low level until the cows were on grass in the spring. The consumption of grass was followed by a rapid rise in the quantities of these factors in the butter. Cows fed artificially dried nonnitrogen-treated grass showed an increase in these factors very shortly after the change from the control diet, and a high level was maintained until they were again placed on the control diet. The results with nitrogen-treated artificially dried grass were even more favorable. Grass silage was a little better than a normal winter ration in its effect on the color and vitamin A content of butter. It is concluded that feeding artificially dried grass maintained during the winter months the relatively high proportions of carotene, xanthophyll, and vitamin A of summer butter.

The unsaponifiable matter of dry grass had a higher value for both carotene and xanthophyll when determined by the spectroscopic blue test with antimony trichloride than when determined by the direct absorption spectrum method. It was definitely established that the unsaponifiable matter of the grass contained ergosterol.

Some further observations on factors which influence the component fatty acids of butter, H. K. Dean and T. P. Hilditch (*Biochem. Jour.*, *27 (1933), No. 3, pp. 889–897*).—Continuing this study (E. S. R., 65, p. 666), a series of butterfats was studied by means of the usual analytical characteristics, supplemented by several detailed analyses of the component fatty acids.

A seasonal change in character was found which consisted of an abrupt increase during the spring months in the proportion of the oleic and linoleic acids, with a parallel diminution in the butyric and stearic acids. This change occurred when the cows returned to pasture after indoor winter conditions and took place within a very short time after the change. The increase in unsaturated acids amounted to about 4 percent (mols), and the diminution in saturated acids appeared to be equally shared by butyric and stearic acids.

Another change, which was a function of the age of the cow and not seasonal, consisted of a gradual increase in the amount of unsaturated components of the fat over a period of years, mainly at the expense of palmitic acid. This acid declined from 29 to 22–23 percent as the age of the cows increased from 4.5 to 7.3 yr.

Observations on some factors in the milk of individual cows which modify the growth of lactic streptococci, H. R. Whitehead and G. A. Cox

(*Biochem. Jour.*, *27* (*1933*), *No. 3*, *pp. 951–959*, *figs. 3*).—Studies at the Massey Agricultural College, New Zealand, were undertaken to determine the influence of various factors on the acid production which takes place in rennet curd during the process of cheese manufacture.

When milk contained leucocytes in excess of 5,000,000 per cubic centimeter, lactic streptococci were not able to develop normal quantities of acid in the rennet curd. Such milk was often secreted by cows not suffering from evident disease of the udder. This inhibitory effect of leucocytes could be eliminated by heating the milk at 49° to 52° [C.] for 30 sec. There were significant variations in the rates of acid production in rennet curds prepared from milks of individual healthy cows from animal to animal and in one animal from day to day. Some of the differences were probably associated with varying amounts of protein and moisture in the curd, and they also appeared to be connected to some extent with the number of cells present in the milk. The apparent stimulating effect of cells in small numbers upon the growth of lactic streptococci was evident even after pasteurizing at 63° for 30 min. It was evident that some stimulating substance, stable to moderate heat, had to be secreted in the milk and that its presence was governed by the same factors that govern the presence of the cells.

Advances in cheese research at Geneva, J. C. Marquardt (*Farm Res.* [*New York State Sta.*], *1* (*1935*), *No. 3*, *p. 8*, *figs. 3*).—In this article the author reviews the history of cheese investigations at the station and points out the benefits to the industry resulting from the work with cream cheese.

The manufacture of cream cheese by the Geneva method, A. C. Dahlberg and J. C. Marquardt (*New York State Sta. Tech. Bul. 226* (*1934*), *pp. 16*, *fig. 1*).—A new method of manufacturing cream cheese, developed and publicly patented, is described. The method consists of the solidification of hot cream by pressure homogenization. The cream is standardized to a desired composition before pasteurization and homogenization since there is no whey drainage. The cheese may be allowed to develop an acid flavor by adding a suitable culture after pasteurization, a cheese flavor such as Cheddar or Roquefort by adding cheese to the cream before pasteurization, or other food flavors may be obtained by adding ground olives, pimientos, sweet pickle relish, etc., after homogenization.

Iowa Blue cheese, E. F. Goss, V. Nielsen, and M. Mortensen (*Iowa Sta. Bul. 324* (*1935*), *pp. 249–277*, *figs. 14*).—A process for the manufacture and curing of Iowa Blue cheese, a Roquefort-type cheese from cows' milk, and the equipment needed in its manufacture are described. By following this process a yield of 2.7 lb. of cured cheese was obtained per pound of fat in the milk. The total cost of manufacture, exclusive of the milk, was estimated at 11.4 ct. per pound of cheese. When sold at 32 ct. per pound the cost of production left a balance of $2.24 per 100 lb. of 4-percent milk to pay for the required milk. The favorable reception accorded the cheese during the experiments indicated a ready market for it.

Cheese ripening studies.—The nitrogen requirements of the lactic acid bacteria: The effect on the sugar-fermenting abilities of enriching peptic caseinogen digest broth with yeast extract, W. Sadler and B. A. Eagles (*Biochem. Jour.*, *27* (*1933*), *No. 3*, *pp. 771–777*).—Continuing these studies (E. S. R., 70, p. 88), the results of investigations are reported on the use of yeast extract for enriching various mediums used in growing bacteria isolated from ripening Kingston cheese.

Determination of fat in cottage cheese by modified Babcock method, V. Kniaseff (*Milk Dealer*, *24* (*1935*), *No. 5*, *p. 46*).—In this article the author

describes a convenient, simple, rapid, fairly accurate, and inexpensive method for determining the fat content of cottage cheese.

Improved Babcock method for determination of fat in ice cream, V. Kniaseff (*Ice Cream Rev., 18 (1935), No. 6, pp. 30, 65*).—A convenient, simple, and rapid modification of the Babcock test for determining the fat content of ice cream is described in this article.

VETERINARY MEDICINE

[Report of work in animal pathology and parasitology by the Florida Station] (*Florida Sta. Rpt. 1934, pp. 37, 41, 43, 45, 46*).—Reporting upon the work of the year, reference is made to investigations of hemorrhagic septicemia in cattle and swine, by D. A. Sanders; and to the etiology of fowl paralysis (E. S. R., 72, p. 843; 73, p. 109), the effect of feeding crotalaria seed to chickens and other birds (E. S. R., 72, p. 391), the effect of feeding colon organisms and dried whey on the bacterial flora of baby chicks affected with pullorum disease, and the etiology of leucosis in the domestic fowl, all by M. W. Emmel.

[Report of work in animal pathology and parasitology by the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 25, 29, 65, 66*).—The work of the year referred to (E. S. R., 71, p. 241) includes abortion in guinea pigs, the relation of the leucocyte count on composite samples of herd milk to the percentage of normal and diseased quarters of the cows in the herds as revealed by the paper test, the influence of the ration on the death rate in pigs farrowed by gilts, posterior paralysis in swine, histopathological studies of hog cholera, cervicitis in heifers infected with *Brucella abortus*, media for growing *B. abortus*, the agglutination test for Bang's disease, hog cholera serum tests, a hog cholera remedy test, etc.

[Report of work in animal pathology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1934, pp. 34, 80–83, 84*).—The work briefly referred to includes colloidal iodine feeding experiments with bovine mastitis, fowl paralysis, bronchitis, leukemia, and the loss of cattle from poisoning with field horsetail and horse nettle (*Solanum carolinense*).

[Work in animal pathology, parasitology, and toxicology by the South Dakota Station] (*South Dakota Sta. Rpt. 1934, pp. 19, 23, 24–29, 30, 42–44, 48, 49*).—The work of the year referred to (E. S. R., 70, p. 825) includes cyanide poisoning from sorghum, by A. N. Hume; the value of oil of chenopodium in the treatment of pigs for worms, by J. W. Wilson; so-called "alkali disease" and selenium poisoning, by K. W. Franke; the detection of mastitis in the milking herd, by T. M. Olson; a pharmacological study of oil of chenopodium, by F. J. LeBlanc (E. S. R., 71, p. 537); the effect of "alkalied" grain on growing chicks and poultry, by W. C. Tully; and hemorrhagic septicemia, by C. C. Lipp.

[Work in animal pathology by the Tennessee Station] (*Tennessee Sta. Rpt. 1933, pp. 32, 33*).—Brief reference is made (E. S. R., 70, p. 244) to Bang's disease control, by M. Jacob, and to the efficiency of soil disinfectants, particularly sodium acid sulfate, employed against *Salmonella pullorum*, *Bacillus avisepticus*, *Eimeria tenella*, and *Amoeba meleagridis*, by P. W. Allen.

[Contributions on animal parasites and diseases] (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vol. 4, pp. 2907–3078, figs. 12*).—Contributions presented at the Fifth Pacific Science Congress, held in Victoria and Vancouver, B. C., in June 1933 and published in 1934, include the following: Foot and Mouth Disease: Differential Diagnosis, by J. Traum (pp. 2907–2910); Rinderpest, Its Control and Differential Diagnosis in Chosen, by C. Kakizaki (pp. 2911–2913); Neurotropic Virus Infections of the Horse, by K. F. Meyer (pp. 2915–2925);

Studies with the Californian Strain of the Virus of Infectious Myxomatosis [of Domestic Rabbits], by J. F. Kessel, R. T. Fisk, and C. C. Prouty (pp. 2927–2939); Infectious Diseases of General Interest to the Pacific, by G. Hilton (pp. 2941–2947); Salmon Poisoning: Transmission and Immunization Studies, by B. T. Simms and O. H. Muth (pp. 2949–2960), contributed from the Oregon Experiment Station; Poultry Diseases: Recent Discoveries, by J. R. Beach (pp. 2961–2968); A Review of Recent Investigations in Turkey Diseases, by W. R. Hinshaw (pp. 2969–2976), contributed from the California Experiment Station; The Significance of Wild-Life Diseases, by J. E. Shillinger (pp. 2977–2980); Parasites of Fur-Bearing Animals, by J. A. Allen (pp. 2981–2989); Notes on *Entamoeba muris* (Grassi) and *Trichomonas caviae* Davaine, by C. C. Wang and D. Nie (pp. 2991–2993); Principal Diseases of Animals and Their Control: A Summary, by E. A. Bruce (pp. 2995–3002); On Sterility, by A. Savage (pp. 3003–3011); The Control of Bang's Disease on the Pacific Slope of North America, by C. M. Haring (pp. 3013–3022); Identification and Differentiation of the *Brucella* Group, by K. F. Meyer (pp. 3023–3031); Pleuro-pneumonia Contagiosa of Bovines, by M. Henry (pp. 3033–3046); Anaplasmosis in Cattle, by W. H. Boynton (pp. 3047–3053); Rabies and Its Control in Japan, by S. Kondo (pp. 3055–3060); Caseous Lymph-adenitis in Sheep, by H. R. Seddon (pp. 3061–3072); Enzootic Haematuria (Haematuria Vesicalis) of Cattle in South Australia, by L. B. Bull, C. G. Dickinson, and A. T. Dann (pp. 3073, 3074); and American Trypanosomiasis: The Northward Extension of Brazilian Trypanosomiasis, or Chagas' Disease, among Mammals in California, by C. A. Kofoid (pp. 3075–3078).

[Parasites and diseases of livestock and their control in Cuba] (*Cuba Sec. Agr., Com. y Trab. Bols. 1 (1929), pp. 7, figs. 2; 2 (1929), pp. 24, pl. 1, figs. 12; 7 (1929), pp. 31, figs. 11; 9 (1930), pp. 19, figs. 12; 10 (1930), pp. 26, figs. 12; 11 (1930), pp. 10, figs. 4; 12 (1930), pp. 14, figs. 7; 13 (1930), pp. 18, figs. 13; 17 (1931), pp. 17, figs. 8; 18 (1932), pp. 47, figs. 13; Cuba Sec. Agr. Bol. 19 (1935), pp. 49–160+[4], pl. 1, figs. 45*).—Practical accounts are given of the infectious diseases and parasites of livestock in Cuba: Bulletins 1, Protection of Pigs, by A. Iduate; 2, The Eradication of Ticks, and 7, The Principal Diseases of Swine, both by R. de Castro; 9, The Sanitary Method of Raising Swine, 10, Ectoparasites of Swine, 11, The Sand Flea [*Sarcopsylla penetrans*] and the Screw Worm, 12, Hepatic Distomatosis and Echinococcus, and 13, Cysticercosis and Trichinosis, all by V. M. Peraza; 17, The Cattle Tick, by J. Bagué; and 18 and 19, Common Infectious, Parasitic, and Other Diseases of the Fowl, by I. R. Nieves.

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk., 66 (1933), Nos. 1, pp. 1–85, figs. 21; 2, pp. 97–172, figs. 5; 3, pp. 173–273, figs. 31; 4, pp. 275–361, figs. 8; 5, pp. 363–444, figs. 13; 6, pp. 445–526, figs. 27*).—The contributions presented (E. S. R., 73, p. 98) include the following: Combined Electrocardiogram-Heart Sound Records of Men and Animals, by K. Neumann-Kleinpaul and H. Steffan (pp. 1–14); The Control of Liver Fluke and Lungworm Disease in Districts Bordering on the Seacoast, I, II–V, by E. Lührs (pp. 15–31, 149–167); Physiological Atresia of the Ovarian Follicles and Interstitial Cells, by J. Kovács (pp. 32–46); Studies on the Control of Streptococcic-Mastitis of Cattle—II, Epizootological Observations, by W. Steck, W. Bachmann, P. Kaestli, and E. Gygax (pp. 47–59) (E. S. R., 70, p. 827); Investigations of the Etiology of Grass Tetany—II, The Influence of High Protein Intake, by B. Sjollema and L. Seekles (pp. 60–69) (E. S. R., 73, p. 99), III, Feeding Cattle on Grass Containing Nitrate: The Combined Effect of Nitrate and Grass Protein on the Mineral Content of the Blood Serum, by L. Seekles and B. Sjollema (pp. 117–

123); Rinderpest in Turkey: Methods of Control and New Experiments, by R. Ismail and M. Zühdi (pp. 70–85); Diagnosis Investigations of Hog Cholera, by P. Uhlenhuth, H. Miessner, and W. Geiger (pp. 97–116); The Ophthalmic Reaction in *Brucella abortus* Infection of Cows, by J. van der Hoeden (pp. 124–135); The Body Temperature, Heart Activity, and Respiration of the Silver Fox, by J. Nörr (pp. 136–148); Experimental Demonstration of the Route of Streptococcus Mastitis Infection: A Note with Corrections on the Work of Schmidt-Hoensdorf and Schmidt (E. S. R., 73, p. 100), by M. Seelemann (pp. 168–172); Vesicular Stomatitis and Foot-and-Mouth Disease: A Critical Experimental Comparative Study, by K. Wagener—I, Etiology, Virus Biology, and Clinical Manifestations (pp. 173–188), II, Correlation of Virus and Animal Body, (pp. 301–316), III, Epizootology, Differential Diagnosis, and Control (pp. 363–380); Studies of Enteritis of Cattle Due to *Bacterium enteritidis*, by Karsten (pp. 189–202); Experimental Investigations of Canine Distemper and Its Prevention by a New Vaccine, by R. Kantorowicz (pp. 203–233); Investigations of the Histological Changes in the Middle Uterine Artery of Cattle Produced by the Functional Requirements of Gestation, by G. Peitzer (pp. 234–253); Investigations of the Histological Changes in the Internal Spermatic Artery and Its Two Branches and in the Posterior Uterine Artery of Cattle Produced by the Functional Requirements of Gestation, by G. Schacht (pp. 254–269); Errors in Measurement of the Blood Pressure of Horses with the Tonoszillograph and Ring Compressor of Plesch; Remarks on the Contribution of Neumann-Kleinpaul (E. S. R., 73, p. 101), by J. Plesch (pp. 270, 271), with reply by K. Neumann-Kleinpaul and H. Steffan (pp. 272, 273); The Period of Hog Cholera Virus Elimination, by P. Uhlenhuth, H. Miessner, and W. Geiger (pp. 275–300); Experiments with Cattle on the Carrier Period of *Bacterium enteritidis*, by Rievel (pp. 317–332); Animal Experiments in Determining the Pathogenicity of Trichomonads Found in the Bovine Reproductive Organs, by J. Witte (pp. 333–343); Basal Cell Cancer of the Skin in the Dog and Cat, by H. Baumgärtner (pp. 344–350); The Inflammation Problem, by N. Sysak (pp. 351–359); A Valve Mouth Piece for the Naso-Pharyngeal Probe, by H. Steffan (pp. 360, 361); Comparative Investigations of the Efficacy of the Pox Vaccines Recommended for Immunization against Fowl Pox, by H. Hartwigk (pp. 381–392); The Morphology of *Gastrophilus* Eggs, by L. Freund (pp. 393–402); Serum Simultaneous Vaccination against Hog Cholera, by Uhlenhuth, Miessner, and Geiger (pp. 403–423); The Coccidia of Foxes in Transcaucasia, by W. F. Gousseff (pp. 424–428); Pressure Diverticulum of the Esophagus in the Abdominal Cavity of the Horse with Opening in the Stomach, by P. Marajew (pp. 429–434); Hematoma in Both Kidney Capsules of Swine, by K. Fritzsche (pp. 435–438); Biological Observations of Metastrongylids and the Diagnosis of Lungworm Infestations: Reply to E. Lührs (see above), by R. Korkhaus (pp. 439–442); Liver Fluke and Lung Worm Disease: A Reply, by Lührs (pp. 443–444); The Endoscopic Picture of the Diseased Gutteral Pouch of the Horse, with Special Reference to Retropharyngeal Abscesses and Their Treatment, by E. Gratzl (pp. 445–484); The Diagnostic Evaluation of the Sublimate Test in Equine Infectious Anemia, by T. Oppermann (pp. 485–504); Experimental Disinfection of Hemorrhagic Septicemia Infected Cattle Cars, by R. Helm (pp. 505–511); The Hydrogen-Ion Concentration of the Blood of Normal and Diseased Horses, by A. Meyer (pp. 512–520); and Ulcerations (Stigmata) in the Stomach of Rats: A Contribution to the Diseases of Small Laboratory Animals, by Holz (pp. 521–526).

[Contributions on diseases and parasites of animals and their control, and on poisoning, in the Union of South Africa] (*Onderstepoort Jour. Vet.*

Sci. and Anim. Indus., 3 (1934), No. 2, pp. 261–473, figs. 25).—The contributions here presented (E. S. R., 72, p. 529) include the following: *Eperythrozoon ovis* (sp. nov.) Infection in Sheep, by W. O. Neitz, R. A. Alexander, and P. J. du Toit (pp. 263–271); Investigations into the Transmission of Horsesickness at Onderstepoort during the Season 1931–1932, by O. Nieschulz, G. A. H. Bedford, and R. M. du Toit (pp. 275–334); Rabies in South Africa—Occurrence and Distribution of Cases during 1933, by W. O. Neitz and A. D. Thomas (pp. 335–343); Preliminary Note on the Life-History of *Gaigeria pachyscelis* (Raill. and Henry 1910), a Hookworm of Sheep (pp. 347–349) and On *Habronema murrayi* sp. n. from the Barn Owl *Tyto alba* (pp. 351–355), both by R. J. Ortlepp; and The Toxicology of Plants in South Africa, by D. G. Steyn (pp. 359–473).

Allergic reactions of actinomycetes, D. R. MATHIESON, R. HARRISON, C. HAMMOND, and A. T. HENRICI (*Amer. Jour. Hyg., 21 (1935), No. 2, pp. 405–421*).—"Infection and immunization with acidfast actinomycetes tend to produce an allergic sensitization in experimental animals. No cross-sensitization to tuberculin could be demonstrated. Continued immunization leads to desensitization. Normal individuals give more frequent and more marked skin tests to *Actinomyces bovis* than do actinomycotic patients. Whereas single injections of *A. bovis* rarely produce infection, repeated inoculations usually do. This is in agreement with the findings of Nakayama, who first suggested that allergic sensitization is a factor in the etiology of actinomycosis. No sensitization demonstrable by skin tests could be induced in rabbits inoculated with saprophytic aerobic actinomycetes. Representative actinomycetes do not elicit reactions similar to those described by Schwartzman for meningococci and other bacteria."

Anaplasmosis [trans. title], S. BAKKER (*Nederland. Indische Bl. Diergeneesk., 46 (1934), No. 3, pp. 134–144; Ger., Eng. abs., pp. 143, 144*).—An account is given of anaplasmosis in water buffaloes, a disease rather common in the Madiun district of Java. The disease often occurs associated with surra, the symptoms of which are difficult to separate clinically, especially in the initial stage of anaplasmosis. In the control of anaplasmosis under field conditions the author practices regular dipping and the administration of trypaflavine in doses of 1.4 g in a 2 percent solution for adult buffaloes, from 0.8 to 1 g for heifers, and from 0.25 to 0.5 g for calves. The trypaflavine solution has to be slowly injected intravenously under strict precautions, as it may cause local necrosis when deposited in the subcutis.

Septicaemia hemorrhagica in the milk cow [trans. title], J. A. KALIGIS and J. P. FOOY (*Nederland. Indische Bl. Diergeneesk., 46 (1934), No. 3, pp. 144–149; Ger., Eng. abs., p. 149*).—The authors observed five cases of pasteurellosis in stable-fed milk cows, four of which were promptly cured through intravenous injections of trypaflavine (50 cc of a 2-percent solution per injection for adult animals).

Studies on surra.—I, The outbreak of surra in 1933 in the college of agriculture, M. MANRESA (*Philippine Agr., 23 (1935), No. 9, pp. 749–757*).—A detailed account is given of an outbreak of surra, including its history, methods of control, possible sources of infection, and symptoms of the disease.

Morphological and biological investigations of Trichophyton megalospora of the equine and bovine [trans. title], J. LEBASQUE (*Ann. Parasitol. Humaine et Compar., 12 (1934), No. 5, pp. 418–444, pls. 2, figs. 3*).—This report of studies of the megalospore species of *Trichophyton*, with descriptions of three found in 1933 to be new to science, is presented with a list of 12 references to the literature.

Contribution to the study of the crossed allergic reactions in tuberculosis and Bang's disease [trans. title], W. SARNOWIEC (*Ann. Inst. Pasteur, 53 (1934), No. 2, pp. 166–173*).—In the investigation reported it was found that in some cases the tuberculous guinea pig reacts to abortin (bacterial suspension), the intensity of the reaction increasing in advanced cases of the disease. However, guinea pigs experimentally infected with *Brucella abortus* did not react to tuberculin or those vaccinated with B. C. G. to abortin. It is pointed out that in the human body affected with tuberculosis abortin may provoke a reaction analogous to that of tuberculin, but it appears and disappears earlier. Bovines affected with *B. abortus* at times react feebly to tuberculin.

Skin penetration experiments with the infective larvae of Stephanurus dentatus, L. A. SPINDLER (*North Amer. Vet., 15 (1934), No. 10, pp. 32–36*).—The author's studies, together with the earlier findings of Schwartz and Price (E. S. R., 62, p. 774; 66, p. 574) and others, are considered to indicate that *S. dentatus* larvae are able to penetrate the intact skin of the host animal only when something is present on the skin against which they can brace themselves. In nature this substance is evidently soil or other debris which adheres to the bodies of these animals.

Brucelliasis and tuberculosis: A case of mixed infection of the udder with Brucella abortus and Mycobacterium tuberculosis [trans. title], L. ROUX (*Schweiz. Arch. Tierheilk., 76 (1934), No. 11, pp. 553–559*).—A mixed infection with *B. abortus* was found in three of seven cases of tuberculous mastitis observed from 1931 to 1933. A case of mixed infection in a cow under observation and study during a period of 6 mo., followed by autopsy, is reported upon. Reference is made to the study of Dubois (E. S. R., 72, p. 254).

A whole-blood field agglutination test for Bang's disease in range cattle, H. WELCH and H. MARSH (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 4, pp. 493–507, figs. 7*).—In studies at the Montana Experiment Station the authors have found that a whole blood agglutination test for *Brucella* infection in cattle, using a stained antigen, is as dependable as the standard serum tests. The stained antigen is recommended for plate tests of serum also, as the reaction is more easily read with this antigen over a light in a dark box. A technic developed for field testing, using whole blood and stained antigen, which makes it possible to test range herds of cows without individual identification and without the necessity of a second handling of the cattle, is described. This test is recommended for an annual test of range herds at shipping time, to be followed by culling and shipping all reacting animals.

A live-germ vaccine for Bang's abortion disease of cattle.—Preliminary note, C. H. KITSELMAN (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 4, p. 526*).—In work at the Kansas Experiment Station the author has developed a strain of *Brucella abortus* var. *bovis* which does not produce agglutinins in cattle following the injection of massive doses of a vaccine prepared from it, although a thermal response is noted following each injection. Cattle that are negative to the agglutination test for Bang's disease remain completely negative to the rapid and tube tests following vaccination. It is said that the newly developed strain when used for preparing a vaccine differs from the Huddleson strain in that no agglutinins are produced for even a brief period of time, which fact should tend to render such a vaccine of considerable value for conferring protection against Bang's disease in those herds which are accredited or are in the process of becoming accredited.

Bang's abortion disease of cattle, C. H. KITSELMAN (*Science, 81 (1935), No. 2102, p. 363*).—This contribution from the Kansas Experiment Station relates to the work above noted.

The etiology of enzootic bovine haematuria, part 1, S. C. A. DATTA (*Indian Jour. Vet. Sci. and Anim. Husb., 4 (1934), No. 4, pp. 341–361, pls. 12*).—Evidence is presented to show that the hitherto obscure enzootic bovine hematuria is a parasitic disease, caused by a large protozoan parasite. The parasite represents a new form, resembling *Entamoeba histolytica*, for which the name *E. kamala* n. sp. is proposed.

The detection of mastitis in dairy herds, D. H. JACOBSEN and T. M. OLSON (*South Dakota Sta. Bul. 290 (1935), pp. 15*).—A practical account dealing with the causes and control of mastitis, the progress of work on the subject, methods of procedure, and a discussion of the results of comparative tests, presented with a list of 16 references to the literature.

"The bromothymol blue test, the catalase test, and the cell count all appear to detect abnormal milk effectively. The bromothymol blue test, however, is simpler as a control measure and can be recommended for use in the control of mastitis in the milking herd. Microscopic examination of stained smears is not a good routine method of detecting 'mastitis' milk when used alone, because a relatively low percentage of the samples from abnormal udders contain long-chain streptococci. Positive bromothymol blue, catalase tests, and high cell count do not definitely prove mastitis infection, but the tests are an indication of abnormal milk which is at least presumptive evidence of an abnormal udder condition."

Mastitis in dairy cows and its control, A. W. STABLEFORTH (*Jour. Min. Agr. [Gt. Brit.], 41 (1935), No. 10, pp. 945–955*).—A practical summary of knowledge of the disease.

Nasal granuloma in cattle in Louisiana, G. DIKMANS (*North Amer. Vet., 15 (1934), No. 9, pp. 20–24, figs. 9*).—In this preliminary note the author reports that certain bodies which resemble *Rhinosporidium* in their general development have been found in the nasal secretions of animals suffering from nasal granuloma at Jeanerette, La. Aggregations of granules were found located in the walls of the mucous glands of sections of the nasal mucosa of these animals which, in the author's opinion, are directly related to the bodies found in the nasal secretions and probably have an etiological relation to the bovine nasal granuloma. It is suggested that they may belong to a fungus closely related to the genus *Rhinosporidium*.

A report of observations of this disease by Creech and Miller has been noted (E. S. R., 69, p. 715).

Report on brine treatment of *Hypoderma* larvae in the backs of cattle, J. STOTCHIK (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 4, pp. 488–492*).—The author's studies, in which a saturated solution of sodium chloride was applied to both haired and clipped cattle as a wash and also injected directly into the grub cysts, indicate that it is nonlethal for all stages of *Hypoderma* larvae in the backs of cattle.

A circumscribed squamous crustated dermatitis of the bovine in the Dutch East Indies known as "cascado", III [trans. title], C. BUBBERMAN and F. C. KRANEVELD (*Nederland. Indische Bl. Diergeneesk., 46 (1934), No. 2, pp. 67–73, figs. 4; Ger., Eng. abs., p. 73*).—The authors have found that the skin disease of cattle (E. S. R., 72, p. 839) caused by *Stephanofilaria dedoesi* in the Minahassa district of Celebes also affects the goat. The name stephanofilariosis is proposed to replace that of dermatitis verminosa pruriens bovis.

Stephanofilariosis, IV, V [trans. title], C. BUBBERMAN and F. C. KRANEVELD (*Nederland. Indische Bl. Diergeneesk., 46 (1934), Nos. 2, pp. 111, 112; Ger., Eng. abs., p. 112; 3, pp. 149–151, pls. 4; Ger., Eng. abs., p. 151*).—The authors have determined that stephanofilariosis (filarial dermatitis), formerly described from

northern Celebes and south Sumatra, also occurs in cattle on the island of Java. A description is given of two very pronounced cases of stephanofilariosis in oxen from northern Celebes.

Poisoning by Mimosa invisa Mart. [trans. title], A. DOEGLAS (*Nederland. Indische Bl. Diergeneesk., 46 (1934), No. 3, pp. 151–160; Ger., Eng. abs., pp. 159, 160*).—Sudden deaths among buffaloes observed by the author were attributed to ingestion of *M. invisa*, a well-known green manure plant.

The nitrite-thiosulphate combination as a remedy for cyanide poisoning in sheep, H. BUNYEA, J. F. COUCH, and A. B. CLAWSON (*Jour. Wash. Acad. Sci., 24 (1934), No. 12, pp. 528–532*).—In continuing the work previously noted (E. S. R., 72, p. 253), the authors found the combination of sodium nitrite and sodium thiosulfate to protect with reasonable certainty against 2.75 m. l. d. of cyanide, particularly when the remedy is administered promptly. "Increasing the dose of nitrite to 2 and 3 g did not result in improvement, while introducing an unfavorable element due to the toxicity of the nitrite itself. Increasing the dose of thiosulfate may have resulted in some improvement and does not, of itself, introduce another toxicity factor. The nitrite-thiosulfate combination was definitely more effective with sheep than with cattle. Doses of sodium nitrite above 95 mg per kilogram are likely to be fatal and above 50 mg per kilogram are dangerous. The safest therapeutic dose that can be recommended for cyanide poisoning is 1 g intraperitoneally for a 75- to 90-lb. (35- to 40-kg) sheep, and 2 g is the largest dose that should be given."

The relationship between time of administration and effectiveness of remedies for cyanide poisoning, J. F. COUCH, H. BUNYEA, and A. B. CLAWSON (*Jour. Wash. Acad. Sci., 25 (1935), No. 2, pp. 57–59*).—In studies conducted in continuation of those above noted, the combination of 1 g of sodium nitrite and 2 g of sodium thiosulfate used as a remedy in cyanide poisoning was found effective when administered promptly. "The combination protected when injected intraperitoneally within 4 min. after drenching an average-sized sheep with 1.5 m. l. d. of potassium cyanide, but did not protect after a longer interval except in the cases of unusually resistant sheep. One-half of a gram of methylene blue in solution similarly administered did not protect in 4 min. Three sheep out of 19 showed atypical behavior when poisoned with the cyanide."

Acidosis of pregnant ewes: So-called pregnancy disease of sheep, W. W. DIMOCK, D. J. HEALY, and F. E. HULL (*Kentucky Sta. Bul. 354 (1934), pp. 241–268, figs. 3*).—The results of a study of this condition (E. S. R., 61, p. 373), which occurs among sheep during the months of January and February a few weeks previous to lambing and which may continue throughout the lambing period, are presented in detail in 17 tables.

It has been found that "in acidosis of pregnant ewes, with few exceptions, the urine is acid, contains albumin, acetone, and increased ammonia. The blood calcium is lowered and the blood phosphorus increased so that the ratio Ca : P is always less than normal. There were but two exceptions to this in our 61 cases, and one of these recovered and was the only case that did recover. The condition is clearly an acidosis resulting from improper nourishment and care of ewes and increased demand on the maternal calcium during the last 2 mo. of pregnancy. Advanced cases of acidosis of pregnant ewes appear hopeless, but the condition can be prevented by proper nourishment and care of ewes during pregnancy."

A list of 23 references to the literature is included.

Nairobi sheep disease: Natural and experimental transmission by ticks other than Rhipicephalus appendiculatus, R. DAUBNEY and J. R. HUDSON (*Parasitology, 26 (1934), No. 4, pp. 496–509, figs. 3*).—Extensive outbreaks of

Nairobi sheep disease in localities from which the normal vector, *R. appendiculatus*, is absent, resulting in a heavy mortality, led to investigations in which *Amblyomma variegatum* was proved to be involved in the transmission. It was found possible to infect sheep by *A. variegatum* nymphs that had been infected as larvae and by adults that had been infected as nymphs. Thus far the authors have not succeeded in demonstrating the passage of the virus from the infected female through the egg to the larva. It is tentatively concluded that *A. variegatum* is a less efficient vector than *R. appendiculatus*.

Third outbreak of paratyphoid dysentery in lambs, I. E. Newsom and F. Cross (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 4, pp. 534–536*).—Contributing from the Colorado Experiment Station, the authors report upon a third outbreak (E. S. R., 63, p. 76) of paratyphoid dysentery in sheep which occurred at Ault, Colo., in a shipment of 1,500 lambs loaded at Sterling City, Tex., in October 1934.

A note on the treatment of tapeworm (Moniezia spp.) infestation of sheep, H. McL. Gordon (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8 (1935), No. 1, pp. 21–24*).—The author has found arsenic trisulfide to be very efficient in removing species of *Moniezia* from sheep when administered either in powder form or suspended in copper sulfate solution. Copper sulfate alone was efficient in one of two cases treated.

Lungworms (Dictyocaulus filaria Rudolphi) in sheep and goats, J. N. Shaw (*Oregon Sta. Bul. 327 (1934), pp. 12, figs. 3*).—The artificial infestation of guinea pigs, sheep, lambs, and one kid with *D. filaria* and experimental treatment with some 34 materials were successfully carried out, and information was obtained on the length of life of the parasite after reaching maturity. This parasite lived but a short time in animals that were kept on good feed and comparatively free from other parasites. Attempts to destroy this form in watch glasses proved it to be quite resistant, apparently being protected by the mucus secreted by the lining of the air passages. Attempts to destroy *D. filaria* in the lungs of infested animals resulted in the death of hosts in cases where materials were used that successfully destroyed the parasite in vitro.

Studies on normal agglutinins: The agglutination of Pf. mallei by normal horse sera, R. Lovell (*Jour. Roy. Army Vet. Corps, 6 (1935), No. 2, pp. 69–82*).—In the studies reported, the sera of 314 normal horses, 5 cattle, 8 pigs, 6 goats, and 4 rabbits were tested for agglutinins against two strains of *Pf*[*eifferella*] *mallei*.

"All possessed agglutinins for this organism, the most frequent titer recorded with the equine sera being 1/640 with one strain and 1/320 with the other. Normal agglutinins for *P. mallei* are not affected by heat at 56° C. for half an hour. As judged by absorption tests, these agglutinins are specific. Samples of sera from females show a greater frequency at the higher titers than males. There is no evidence of a greater frequency at higher titers with increasing age in horses over 4 yr. of age. The previous testing of horses with mallein by the intradermal palpebral method has no effect on the agglutination titer. A suspension of a strain of *P. mallei* highly virulent for the guinea pig was agglutinated equally as well as the two standard strains used."

Tick paralysis: A fatal disease of dogs and other animals in eastern Australia, I. Clunies Ross (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8 (1935), No. 1, pp. 8–13*).—In this brief summary of work the author reports having found the paralysis caused by *Ixodes holocyclus* to occur in man, mainly children, and dogs as well as other animals. Evidence has been obtained that the disease is caused by the injection of salivary secretion of the tick following a period of from 4 to 5 days' engorgement on its host. An immunity to the disease was found in a few dogs under natural conditions, the serum of which

animals appeared to be useful as a curative agent for the treatment of affected dogs. The daily removal of ticks from animals exposed to infestations and the use of tick repellents, of which derris was found satisfactory, constitute effective control measures.

Use of elevated wire floors in controlling lungworm infestation in foxes, K. B. Hanson and W. G. McBlain, Jr. (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 4, pp. 463–473, figs. 6*).—The experimental work reported has shown that the confinement of foxes on elevated wire floors is effective in preventing lungworm infestation and is of value also in treating infested animals. "Moving known good mothers to elevated wire floors shortly after mating and having them rear their pups in such pens appears to be safe and effective in preventing lungworm infestation in the pups. Pups born and reared on elevated wire floors remain free of lungworms while they are kept on such floors. They soon acquire infestation, however, upon being moved to infested ground. This occurs even though the pups may be 4 mo. or more of age when moved from the wire. Elevated wire-floored pens of sufficient size and proper design give promise of attaining extensive commercial application on ranches where lungworm trouble is a relatively serious problem."

Later experiments have demonstrated that "elevated wire-floored pens are highly effective also in the prevention of infestations with *Uncinaria stenocephala* and *Capillaria plica*, that fox pups usually do not become infested with these two parasites and lungworms until they leave their dens and run on infested ground, and that lungworm, hookworm, and bladder worm infestation in fox pups can be prevented effectively even when the latter are not moved to the elevated pens until they are 4 or 5 weeks of age."

Epizootic fox encephalitis.—VII, Nature of the immunity, R. G. Green, N. R. Ziegler, B. B. Green, J. E. Shillinger, E. T. Dewey, and W. E. Carlson (*Amer. Jour. Hyg., 21 (1935), No. 2, pp. 366–388*).—In continuation of their studies (E. S. R., 71, p. 393), the authors have found recovery from fox encephalitis to be "accompanied by an acquired permanent immunity which appears to depend upon the presence of antivirus in the blood stream. The development of the acquired immunity evidently requires several weeks in the most susceptible individuals. As fatalities are confined almost entirely to the first week of the disease, acquired immunity probably plays little role in individual recovery. It seems that the degree of natural immunity at the onset of the disease determines recovery from this infection. A serum containing active antivirus can be developed by hyperimmunization. Maximum antivirus content of serum is obtained only after more than a year of weekly injections. Such a serum shows its activity under experimental conditions only when mixed with the virus before injection.

"Delayed infections occur approximately 30 days after the injection of serum-virus mixtures. These delayed infections show the acute symptoms and the presence of the specific inclusions typical of the natural disease. Delayed infections may be prevented by a second injection of serum 3 weeks after the serum-virus injections. Foxes surviving serum-virus injections aided by a second injection of serum are generally immune to the disease, but about 8 percent are still susceptible to experimental infection 6 mo. later."

Available methods for examination of the blood of the fowl, C. Olson, Jr. (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 4, pp. 474–487, figs. 3*).—Five methods that have been recommended for the enumeration of erythrocytes and leucocytes, two methods for the enumeration of thrombocytes, and four methods for the estimation of the quantity of hemoglobin were studied in a comparative way with a view to determining a suitable procedure for the examination of chickens' blood.

The methods for counting erythrocytes were found to give nearly the same results and to have nearly the same degree of accuracy. The method of enumerating leucocytes that utilizes Toisson's solution as a diluent gave more consistent results than the other two direct methods, and when used on normal blood was considered the method of choice. The two methods for the counting of thrombocytes gave results which were not significantly different. The photoelectric and Newcomer hemoglobinometers were in close agreement on measurement of the hemoglobin of the chicken. The Dare and Tallquist hemoglobinometers were not considered to be applicable for the accurate measurement of the hemoglobin of the chicken.

Fowl pox, R. GRAHAM and E. H. BARGER (*Illinois Sta. Circ. 430 (1935), pp. 14, figs. 10*).—A practical summary of information, in which particular attention is given to control measures.

Factors involved in the experimental production and prevention of hock disease in battery brooded chicks, J. E. HUNTER, H. C. KNANDEL, and R. A. DUTCHER (In *Atti del V Congresso Mondiale di Pollicoltura, 1933. Roma: Min. Agr. e Foreste, 1934, vols. 3, pp. 184–189; 4, abs., pp. 83, 84*).—In reporting upon work with hock disease at the Pennsylvania Experiment Station, the effect (1) of mineral supplements on the experimental production of and (2) of oat hulls and oat feed additions to the ration in the prevention of, is reported in detail in tabular form. It was found that hock disease in battery brooded Single Comb White Leghorn chicks can be caused or prevented by mineral adjustments in the ration. The abnormality can be produced by additions to the basal ration of calcium or phosphorus or both and can be brought about under a variety of calcium-phosphorus ratios. Finely ground oat hulls possess some property of prevention of hock disease even under unfavorable mineral conditions. This property cannot be explained on the basis of the fiber or ash content of the hull.

Infectious laryngotracheitis, F. R. BEAUDETTE (In *Atti del V Congresso Mondiale di Pollicoltura, 1933. Roma: Min. Agr. e Foreste, 1934, vols. 3, pp. 165–170; 4, abs., p. 81*).—This is a systematic summary of information on infectious laryngotracheitis of the fowl contributed from the New Jersey Experiment Stations and presented with a list of 28 references to the literature.

Pullorum disease of chicks (bacillary white diarrhea), R. GRAHAM (*Illinois Sta. Circ. 432 (1935), pp. 12, figs. 12*).—This is a practical summary of information on pullorum disease and means of combating it.

The control of avian typhoid by the use of bacterins, R. S. DEARSTYNE, R. E. GREAVES, and H. C. GAUGER (In *Atti del V Congresso Mondiale di Pollicoltura, 1933. Roma: Min. Agr. e Foreste, 1934, vols. 3, pp. 108–114; 4, abs., pp. 74, 75*).—Contributing from the North Carolina Experiment Station, the authors deal with (1) the rapidity of development of antibodies following vaccination and (2) agglutinin production and duration in birds receiving the single, double, and triple vaccination against avian typhoid, considering demonstrable antibodies an index of immunity.

With the view to producing an immunity of greater duration than that obtained from the single vaccination, groups received, respectively, one, two, and three vaccinations at 7-day intervals, macroscopic agglutination tests being applied at these intervals. This led to the conclusion that the success in vaccination will rest largely on the securing of proved antigenic strains for the bacterin. "Apparently, the polyvalent bacterin for general uses gives a greater chance of immunization than that of monovalent character.

"No differences could be noted in the response to vaccination or in susceptibility to the disease of males as compared to that of females. The response to vaccination during the first 3 days after vaccination is rapid, but immunity

developed is not sufficient to resist infection should sufficient number of virulent organisms be ingested during that period. The likelihood of such liberal ingestion under field conditions, however, is remote, and the early immunity so developed should suffice to prevent infection by contact or from infected soil and utensils.

"The peak of agglutinin production brought about by the single vaccination occurs between the seventh and fourteenth days, probably about the ninth or tenth day. In these studies the serum titer of all vaccinated birds dropped to normal by the forty-ninth day after vaccination, 94 percent of the 18 birds studied being normal by the thirtieth day.

"The 1-week interval between vaccinations of birds apparently is too short to obtain a maximum of benefit from an immunological standpoint. Field studies indicate that a 3-mo. interval can be adopted with a reasonable assurance of eliminating the infection in ranging birds. Three vaccinations are indicated.

"The response of fowl to vaccination against typhoid parallels, in general, that of man and of laboratory animals."

Moniliasis (thrush) in turkeys and chickens, W. R. Hinshaw (In *Atti del V Congresso Mondiale di Pollicoltura, 1933. Roma: Min. Agr. e Foreste, 1934, vols. 3, pp. 190–197, figs. 2; 4, abs., p. 85*).—Contributing from the California Experiment Station, the author presents a brief description of moniliasis (thrush) in turkeys and chickens based on experience in the State and a review of the literature. The infection with yeastlike fungi belonging to the genus *Monilia* is confined principally to the mucous membrane of the upper digestive tract and is most prevalent in the crop. Isolations have been made, however, from an abscess in the lung, from abscesses of the skin on the head, and from the infraorbital sinuses of the turkey. Limited trials with the use of 1–2,000 copper sulfate solution as a substitute for drinking water have yielded encouraging results as a control measure.

Pasteurellosis in the swan [trans. title], Vergé and Placidi (*Rev. Gén. Méd. Vét., 42 (1933), No. 504, p. 738; trans. in Vet. Jour., 91 (1935), No. 2, pp. 87, 88*).—A report is made of an outbreak due to *Pasteurella aviseptica* which appeared in an important swannery in 1929 and 1930. It was controlled by the administration of a formolized vaccine but the immunity was not lasting, the disease reappearing in 1930. The intramuscular injection of 0.5 cc of a formolized culture on August 2 and 1 cc on August 10 prevented further mortality.

[Contributions on diseases and parasites of poultry] (In *Atti del V Congresso Mondiale di Pollicoltura, 1933. Roma: Min. Agr. e Foreste, 1934, vols. 3, pp. 1–225, figs. 88; 4, Eng. abs., pp. 63–87*).—Contributions relating to diseases and parasites presented at the Fifth World's Poultry Congress, held at Roma in September 1933, include the following in the section on hygiene and diseases: Diseases of the Fowl—an Epizootiological Study, by D. C. Matheson and J. E. Wilson (pp. 3–9, abs. 63); The Most Important Poultry Diseases in France, by G. Lesbouyries (pp. 10–15, abs. 63); The Extension and Eradication of Poultry Diseases in Denmark, by O. Nielsen (pp. 16–19, abs. 64); On the Infectious and Parasitic Diseases of Fowls in Sardegna (Sardinia), by G. Pegreffi (pp. 20–24, abs. 64, 65); Combating Poultry Diseases by the Government in the Netherlands, by B. J. C. te Hennepe (pp. 25–31, abs. 65, 66); The Legal Basis and the Organization of the Campaign against Poultry Diseases in Switzerland, by G. Flückiger (pp. 32–40, abs. 66, 67); The Influence of Industrialization on Poultry Hygiene, by L. Geurden and J. Martin (pp. 41–46, abs. 67); Study on the Hygiene and Organic Resistance of Fowls on the Industrial Poultry Farm, by E. Huault (pp. 47–52, abs. 67); Results of Recent Studies on

the Diseases of the Upper Respiratory Tracts of Fowls, by O. Seifried (pp. 53–59, abs. 68); Fowl Leukosis, by E. L. Stubbs (pp. 60–65, abs. 68, 69); Ornithostrongylosis of the Pigeon (*Columba livia* Dom.), by E. B. Cram and E. Cuvillier (pp. 66–73, abs. 69); Infectious Paralysis of Fowls Observed in Lombardia (Lombardy), by G. Vianello (pp. 74–80, abs. 70); Abnormal Localization of Cholera in Fowls, by S. Serkowski (pp. 81–86, abs. 70); Pigeon Cholera, by N. Mihailescu (pp. 87–90, abs. 71); On Vaccines for the Prevention of Fowl-Pest, by S. Kondo and N. Nakamura (pp. 91–94, abs. 71, 72); On the Antigenic Power of Fowl-Pest Virus Originating from the Difference of Strains, by N. Nakamura (pp. 95, 96, abs. 72); On the Control of Bacillary White Diarrhea in Japan, by N. Nakamura (pp. 97, 98, abs. 72, 73); Progress in the Rapid Whole Blood Agglutination Test for Pullorum Disease in the United States, by J. M. Schaffer and H. Bunyea (pp. 99–104, abs. 73); The Development of Fowl-Pox Vaccination in the United States, by J. R. Beach (pp. 105–107, abs 74); The Control of Avian Typhoid by the Use of Bacterins, by R. S. Dearstyne, R. E. Greaves, and H. C. Gauger (pp. 108–114, abs. 74, 75), contributed from the North Carolina Experiment Station (see p. 245); Paratyphoid of the Pigeon and Its Prevention, by C. Cernaianu (pp. 115–119, abs. 75, 76); Pseudotuberculosis of Birds, by C. Truche (pp. 120–126, abs. 76, 77); Is There Any Possibility of Limiting Avian Paralysis? by G. Lerche (pp. 127–135, abs. 77, 78); Research on "Fowl Paralysis" and Allied Conditions, by H. P. Bayon (pp. 136–142, abs. 78, 79); Fowl Paralysis (Neurolymphomatosis Gallinarum), by J. Biely, V. E. Palmer, and E. A. Lloyd (pp. 143–150, abs. 79); Fowl Paralysis (Neurolymphomatosis) in England, by T. Dalling and G. H. Warrack (pp. 151–161, abs. 80); Paraplegia from Abnormal Ovulation in the Hen, by A. Mensa (pp. 162–164, abs. 80, 81); Infectious Laryngotracheitis, by F. R. Beaudette (pp. 165–170, abs. 81), contributed from the New Jersey Experiment Stations (see p. 245); Infectious Enteritis in Poultry, by W. Zwick (pp. 171–176, abs. 82); Studies on Fowl Coccidium, by S. Nohmi (pp. 177, 178, abs. 82, 83); Nutritional Encephalomalacia in Chicks, by A. M. Pappenheimer and M. Goettsch (pp. 179–183, abs. 83); Factors Involved in the Experimental Production and Prevention of Hock Disease in Battery Brooded Chicks, by J. E. Hunter, H. C. Knandel, and R. A. Dutcher (pp. 184–189, abs. 83, 84), contributed from the Pennsylvania Experiment Station (see p. 245); Moniliasis (Thrush) in Turkeys and Chickens, by W. R. Hinshaw (pp. 190–197, abs. 85), contributed from the California Experiment Station (see p. 246); Parasitic Worms of the Ceca in Domestic Fowls, by A. Henry (pp. 198–202, abs. 86); Observations on the Body Movements and Mode of Locomotion of *Heterakis gallinae* (Gmelin 1790) Freeborn 1793, a Nematode Parasite of the Domestic Fowl, by A. D. Baker (pp. 203–218, abs. 86); and *Davainea proglottina* and Disease in Fowls. The Pathogenicity of the Common Poultry Parasites: An Unknown Factor in the Causation of Disease, by E. L. Taylor (pp. 219–225, abs. 87).

Several papers presented in other sections of the Congress are noted on page 222.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 8–16, figs. 8*).—The progress results are briefly presented of investigations on mechanical corn production, cornstalk coverage, mechanical corn-picker loss, low-pressure pneumatic tires, use of electric illumination for forcing crops in commercial greenhouses, electric soil heating, relation of electricity to agriculture, operating hay-chopping machine with electric power, codling moth control with electric traps, power consumption in stationary and

portable methods of spraying, precooling of fresh fruits in refrigerator cars, electric brooding, electric dairy sterilizers, combined harvester-thresher, poultry housing, field silage harvester, soil-erosion control, and hay and grain drying.

Agricultural engineering [investigations by the South Dakota Station], R. L. PATTY (*South Dakota Sta. Rpt. 1934, pp. 14–17*).—The progress results are briefly presented of experiments on rammed earth for farm building walls and poultry-house construction, corn-harvesting machinery, field-machinery hitches for tractor and large horse teams, and the effect of protective coverings upon the length of service of steel fence posts.

Surface water supply of the United States, 1932, Part 3: Ohio River Basin (*U. S. Geol. Survey, Water-Supply Paper 728 (1934), pp. X+370, fig. 1*).—This report presents the measurements of flow made on streams in this basin during the year ended September 30, 1932.

Artesian water in Somervell County, Texas, A. G. FIEDLER (*U. S. Geol. Survey, Water-Supply Paper 660 (1934), pp. IV+86, pls. 7, figs. 5*).—This report deals with the artesian water supplies of an area in the Grand Prairie region of north-central Texas which are used chiefly for domestic purposes and for watering stock.

The draft from the artesian reservoir in Somervell County during the summer is estimated at about 1,000,000 gal. a day, distributed as follows: Domestic use 150,000 gal., stock use 60,000, recreation pools 250,000, irrigation 180,000, and waste, not including underground leakage, 360,000 gal. In winter the daily draft is probably about 370,000 gal. less than in summer.

The quality of the water obtained from a depth of more than 50 ft. is satisfactory for domestic use, but the shallow ground water in the surficial deposits is at least in part polluted and hence unsuitable for drinking and cooking. Shallow, insufficiently cased artesian wells and unplugged abandoned wells offer opportunity for the entrance of this polluted water into the artesian supply. Any further lowering of the artesian head will increase the danger of such pollution.

A program for conservation of this artesian water supply is recommended.

[Irrigation investigations by the New Mexico Station] (*New Mexico Sta. Rpt. 1934, pp. 44, 45, 61–68, figs. 2*).—The progress results are briefly presented of investigations on the effects of irrigation on the physical and chemical composition of soils, the duty of water, rate and cause of rise of ground water in the Mesilla Valley, irrigation of potatoes, water requirements and economical use of water for cotton and other crops, and effect of fertilizers and frequency of irrigation on the yield and keeping and marketing qualities of the Early Grano onion.

Irrigation of vegetable crops, F. A. SECRETT (*Sci. Hort. [Wye, Kent, Eng.], 3 (1935), pp. 82–96, figs. 5*).—Practical information is given on the subject, with particular reference to the requirements of English conditions.

Water and sewage research (*New Jersey Stas. Rpt. 1934, pp. 92–97*).—The progress results are presented of studies on sludge dewatering, activated sludge, effect of chlorine in sewage treatment, analyses of sewage and sludges, corrosion of aluminum ware by well water, viability of *Bacillus typhosus* in water and sewage, and the bacteriology of thermophilic and mesophylic sludge digestion.

Water control investigations [by the Florida Station], R. V. ALLISON and B. S. CLAYTON (*Florida Sta. Rpt. 1934, pp. 94, 95, fig. 1*).—The progress results are briefly reported of investigations of water level in soils of the Everglades.

Bridge piers as channel obstructions, D. L. YARNELL (*U. S. Dept. Agr., Tech. Bul. 442 (1934), pp. 52, pls. 8, figs. 24*).—This bulletin presents the results of

about 2,600 experiments on the obstructive effect of bridge piers to flow of water, using larger piers and a more extensive range of conditions than has hitherto been attempted. The tests were conducted by the Bureau of Agricultural Engineering and the University of Iowa during 1927 to 1931.

It is pointed out that the bridge pier formulas most commonly used in the United States are D'Aubuisson's, Nagler's, Weisbach's, and Rehbock's. The discordant results obtained with the Weisbach formula show it to be theoretically unsound.

None of the above formulas give for a certain shape of pier a constant coefficient for all channel contractions. This factor is of vital importance, and is the reason for the inconsistent results obtained in the past by engineers attempting to solve problems involving backwater from bridge piers. The majority of such problems concern cases having channel contractions of less than 20 percent.

As long as the velocities are low enough to keep within what Rehbock calls class 1 flow, any one of the three formulas will give results close enough for practical purposes if the proper coefficient is used. This coefficient varies with the channel contraction as well as the pier shape. Proper values for channel contractions of less than 11.7 percent were not determined, and for most of the pier shapes they also are not determined for contractions greater than 23.3 percent. However, most backwater problems fall within this range, but as the D'Aubuisson and Rehbock formulas give quite different coefficients at 11.7 percent than they do at 23.3 percent, and as no points are known between them, the shape of the curve remains undetermined. This objection does not apply to the Nagler formula because there is little difference in the coefficients for 11.7 percent and 23.3 percent, and the tests of the square and semicircular shapes indicate that a constant average value can be used throughout the range. The Nagler formula also applies through Rehbock's class 2 and into the beginning of class 3. The other two formulas do not apply at these higher velocities (except with continually varying coefficients), and thus fail in the most serious cases of "heading-up" due to extreme floods.

The conclusion is drawn that the height of the backwater due to bridge piers varies directly as the depth of the unobstructed channel. Certain formulas heretofore proposed give approximately correct results for ordinary velocities when the proper coefficients are used, but they do not hold for extremely high velocities. For the lower velocities (class 1 flow) the more efficient shapes are lens-shaped nose and tail, lens-shaped nose and semicircular tail, semicircular nose and lens-shaped tail, convex nose and tail, and semicircular nose and tail.

Twin-cylinder piers either with or without connecting diaphragms, piers with 90° triangular noses and tails, and piers with recessed webs are less efficient hydraulically than those just mentioned, and piers with square noses and tails are least efficient. The addition of batter to the ends of piers slightly increases their hydraulic efficiency. Increasing the length of a pier from 4 times the width to 13 times the width has comparatively little effect on its hydraulic efficiency. In some cases it increases it and in some cases decreases it. The optimum ratio of pier length to width probably varies with the velocity and is generally between 4 and 7.

Placing the piers at an angle with the current has an insignificant effect on the amount of backwater if the angle is less than 10°. Placing the piers at an angle of 20° or more with the current materially increases the amount of backwater, the increase depending upon the quantity of flow, the depth, and the channel contractions.

A large amount of reference material is included, together with an appendix relating to the energy method of computing heading-up due to piers.

Plans for torrential stream structures, G. STEELE (*Grundriss der Wildbachverbauung. Wien (Vienna): Julius Springer, 1934, pp. IX+279, figs. 150*).—This is a technical treatise relating to the design of structures for the control of torrential streams and the prevention of injury therefrom in the mountainous regions of Europe.

Particular attention is devoted to the hydraulic characteristics of mountain torrents, the causes of the destructive tendencies of run-off water, particularly that from storms, movement of water and silt, sources of silt and gravel transported, influence of plant cover in retarding run-off, the engineering features of preventing damage by torrential run-off, and the design and maintenance of run-off control structures.

Measurement of run-off and soil erosion by a single investigator, J. E. WEAVER and W. NOLL (*Ecology, 16 (1935), No. 1, pp. 12, figs. 3*).—In studies conducted at the University of Nebraska, interceptometers 3 ft. long, 8 in. wide, and 18 in. deep with hinged roof were used to catch run-off water and soil from enclosed areas 33.3 ft. long and 3 ft. wide. These were located in native unmowed prairie and in native pasture, both on a 10-degree slope, as well as in native unmowed prairie, a field of wheat, and a fallow area, all on a 5-degree slope. Natural run-off as well as that from artificial watering was compared during a period of 18 to 24 mo. From 2 to 12 times as much run-off occurred in closely grazed pasture as prairie and from 2 to more than 37 times as much from wheat field (stubble) as from prairie. Prairie lost practically no soil by erosion. In wheat stubble the loss was marked, but not so great as in fallow fields where run-off also was greatest.—(*Courtesy Biol. Abs.*)

[Erosion control investigations by the Tennessee Station] (*Tennessee Sta. Rpt. 1933, p. 13*).—These studies emphasize the importance of terracing for the protection of land planted to row crops and the protective action of pasture grasses.

Public Roads, [March 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), No. 1, pp. 16+[2], figs. 10*).—This number of this periodical contains the current status of U. S. Public Works road construction as of February 28, 1935, and the following articles: Broadening the Highway Program, by T. H. MacDonald (pp. 1, 2, 11); A Study of the Lives of Brick-on-Concrete Pavements, by A. Marston (pp. 3–6, 14); The Rising Accident Rate, by W. G. Eliot, 3d (pp. 7–11); and Regulation of Outdoor Advertising Upheld in Massachusetts Court Decision (pp. 12–14).

List of publications [on] chemistry of wood and derived products (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [1]+32*).—This mimeographed list includes publications relating to the chemical composition of wood, chemical and physical properties of wood, chemical industries using wood, particularly for alcohol and other products manufactured, and the chemistry of wood preservatives.

List of publications on the mechanical properties of wood and wood products (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1933, pp. [1]+25*).—Publications listed relate to factors affecting strength, joints and fastenings, methods of determining properties, steam bending, and structural timbers.

List of publications on glue and plywood (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [1]+9*).—A number of publications from governmental and private sources are included in this list.

Behavior of casein and blood glue joints under different conditions of exposure, D. BROUSE (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp.

[1]+8, pl. 1; also in Furniture Manfr., 48 (1934), No. 3, pp. 9–11, fig. 1; Wood Prod., 12 (1934), No. 10, pp. 8–10, fig. 1).—Studies are reported in which well-made plywood specimens of approximately equal strength were exposed to (1) continuous soaking in water, (2) 97 percent relative humidity at a temperature of 80° F., (3) alternate soaking and drying under high mechanical stresses, and (4) alternate high and low relative humidity. A total of 270 specimens for each of three different glues were tested.

The durability of the joints under continued soaking was surprisingly high. After 3 yr. the joints made with blood glue retained 67 percent of their original dry strength, or about 81 percent of the original wet strength. Joints made with the low alkaline casein glue remained in test for 28 mo. before total failure, while the joints made with the casein glue of higher alkalinity failed in 15 mo.

The results support the view that chemical hydrolysis of the protein is the most important factor in the destruction of water-resistant protein glue joints under continuous soaking. The casein glue of high alkalinity failed most rapidly, the casein glue of low alkalinity failed more slowly, and the joints made with the paraformaldehyde blood glue (hot-pressed) were still intact after 36 mo. Presumably, adding paraformaldehyde as a part of the blood glue formula together with hot pressing alters the nature of the protein in blood in such a way that it hydrolyzes very much more slowly than the protein present in a casein glue. Mechanical stresses on the glue joint caused by alternate swelling and shrinking of the wood could scarcely have been a factor in this group of tests.

The results of continuous exposure to 97 percent relative humidity strongly supported the view that untreated glue joints fail under this type of exposure mainly because of attack by micro-organisms. The joints made with the casein glue of low alkalinity failed as rapidly as joints made with the highly alkaline casein glue, and both failed more rapidly than did the joints made with either glue and soaked continuously.

In the repeating cycle of 2 days soaking followed by 12 days at 30 percent relative humidity, all specimens, even those glued with the highly water-resistant blood glue, failed completely by the end of 25 mo. Specimens glued with casein glue failed by the end of 13 mo. Mechanical stresses appeared to be the main cause of failure in this group of tests. The drying period is believed to be particularly damaging to the joints. The plies dry and begin to shrink while the glue is still in the swollen and weakened state from the soaking; the result is an early opening of the glue joint, the failure appearing first at the edges of the specimens. The repeating cycle of 2 weeks at 97 percent relative humidity followed by 2 weeks at 30 percent relative humidity provided conditions favorable to mechanical stresses and moderately favorable to mold action. Mold action was a factor, for the specimens gave clear evidence of the development of molds and other fungi. Mechanical stresses must be considered of major importance, for the plywood changes in moisture content from roughly 25 percent at 97 percent relative humidity to about 7 percent at 30 percent relative humidity. For this type of exposure it appears important to have a glue that first of all withstands mechanical stresses and, secondly, resists mold attack.

List of publications on wood preservation *(U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [1]+27).*—This mimeographed list includes publications relating to crossties, decay, durability, effect of treatment on strength, fireproofing, poles and posts, preservatives such as coal-tar creosote, sodium fluoride, and zinc chloride, wood preservation, termites, shingles, and storage.

[Agricultural engineering investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 83, 84*).—The progress results are briefly presented of investigations on the durability of treated posts and on the treatment of tobacco tent poles.

Fourth progress report: Priming-coat reductions for painting new wood surfaces, F. L. BROWNE (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., [1934], pp. [13]*).—This is a report of a project conducted by the U. S. D. A. Forest Service Forest Products Laboratory in cooperation with several private agencies. The object of the study is to discover the optimum priming-coat reduction in applying common house paints to softwoods and to determine whether the priming coat should be reduced differently according to the nature of the softwood painted.

Four woods and three paints were used in the experiments on priming-coat reduction. The woods were Norway pine, northern white pine, western red cedar, and redwood. The paints were white linseed oil house paints that differed only in the nature of the pigments. In one the pigment was entirely basic carbonate white lead; in the second the pigment contained 60 percent by weight basic carbonate white lead, 30 percent lead-free zinc oxide, and 10 percent magnesium silicate; and the pigment of the third contained 60 percent titanox B, 30 percent lead-free zinc oxide, and 10 percent magnesium silicate.

In the studies of the effect of priming-coat reduction it seems that the ratio of oil to turpentine is more significant, at least within the range of desirable reductions, than is the pigment volume. Apparently a good primer should have at least 2½ times as much linseed oil as turpentine, and it is questionable whether there need be any turpentine in the primer at all. The pigment volume in a good primer for 3-coat painting presumably may be anywhere in the range of 20 to 30 percent, but for 2-coat painting practical considerations require that the pigment volume be in the upper portion of this range. The data suggest the same optimum priming-coat reduction for all woods, namely, reduction with linseed oil and little or no turpentine.

On cedar, white pine, and Norway pine the average durability of the three paints was inversely proportional to the average density of the boards of those species. The durability on redwood, however, was about as great as it was on red cedar, although the density of the boards was nearly the same as the density of the white pine. On redwood and red cedar these paints were proving practically equal in durability, but on white pine and Norway pine the titanox and zinc paint had disintegrated earlier than the other two paints. As a result, there was a greater variation in durability on different woods with the titanox and zinc paint than with either of the other two paints.

With the white lead paint and the titanox and zinc paint the best 2-coat job (priming-coat reduction 2–1) proved equal or superior in durability on the whole to the best 3-coat job (with white primer) applied on the same boards. With the lead and zinc paint the best 2-coat job was slightly inferior to the best 3-coat job on the same boards except on red cedar, where it was better. It is evident that 2-coat painting when done in the manner followed in these experiments is thoroughly practicable, and gives coatings that closely approach good 3-coat work in durability and prove distinctly better than poor 3-coat work.

The best results were obtained with aluminum priming paint followed by two coats of white paint. On all woods except white pine the coatings of all three paints over aluminum primer were still rated fair, minus, or better in integrity at the last inspection, and in all cases except that of lead and zinc paint on white pine the coating over aluminum primer was rated as high or higher in integrity than the best coating over a white primer on the same boards.

Special priming paints for wood, F. L. BROWNE (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [1]+15, pls. 6*).—Twenty special priming paints were subjected to practical exposure tests at Madison, Wis., Fargo, N. Dak., Fresno, Calif., Sayville, N. Y., and Washington, D. C. The special priming paints were compared directly with conventional priming with white finishing paint applied on neighboring areas of the same boards. Two white finishing paints were used, pure white lead paint and a lead and zinc paint. Ten of the special primers proved beneficial in the sense that they retarded disintegration of coatings over the bands of summerwood in southern pine and Douglas fir and made the durability of the coatings on those woods more nearly equal to that on redwood and northern white pine. The best of the special primers tested were those containing "leafing" pigments, aluminum powder, or flake graphite, in long-oil spar varnish.

Behavior of house paints on different woods, F. L. BROWNE (*U. S. Dept. Agr., Forest Serv., Forest Prod. Lab., 1934, pp. [1]+25, pls. 9*).—This mimeographed paper reports data on the effect of kind of wood painted on the serviceability of house paints obtained from observation of practices and experience with houses in service and experimentation by means of test fences.

In conclusion, a classification in tabular form is presented of native woods according to their desirability for exterior house painting by conventional methods.

Experiments on the use of mixtures of gasoline with ethyl and isopropyl alcohols in internal combustion engines, M. S. KUHRING (*Canad. Jour. Res., 11 (1934), No. 4, pp. 489–504, figs. 28*).—Studies at the National Research Laboratories at Ottawa are reported in which engine tests were conducted on gasoline and various mixtures of isopropyl and ethyl alcohols with gasoline and comparisons made with additions of lead tetraethyl in the gasoline. The tests were conducted in two separate groups and included observations of octane number, power, consumption, and highest useful compression ratio. The gasolines used included straight-run aviation gasoline and cracked, casing-head blend gasoline, both of commercial grades.

It is shown that once detonation is suppressed in an engine, little or no further increase in power may be expected by raising the antiknock value of the fuel without also raising the compression ratio.

In the first group of tests specific fuel consumptions when using the ethyl alcohol-gasoline mixtures were higher than when gasoline only was used. This held for both fuels. In the case of the second fuel, the specific consumption was found to be almost the same whether or not the alcohol was used. When lead tetraethyl was added to an alcohol-gasoline mixture there was a further increase in antiknock value, but this increase was not as great as when the lead was added to the same gasoline without alcohol.

In the second group of tests specific fuel consumptions for gasoline-alcohol mixtures were higher than for gasoline only. In the 10 percent alcohol mixtures consumptions were higher when ethyl alcohol was used than when isopropyl alcohol was mixed with the gasoline. In the 20 percent alcohol mixtures the ethyl alcohol consumptions were still somewhat higher than those of the isopropyl mixtures, but with the 30 percent alcohol mixtures specific consumptions were higher for the isopropyl alcohol additions than for ethyl alcohol additions.

Octane numbers which were determined under Cooperative Fuel Research motor method procedure showed the ethyl alcohol to be superior as a knock inhibitor, but when the highest useful compression ratio was determined (under low cylinder temperature conditions) the 10 and 20 percent concentrations

of isopropyl alcohol were found to be superior to ethyl alcohol in the same proportions. Above this concentration ethyl alcohol became more effective than equivalent additions of isopropyl alcohol.

Water tolerance of mixtures of gasoline with ethyl alcohol, isopropyl alcohol, and benzene, C. H. Bayley and C. Y. Hopkins (*Canad. Jour. Res., 11 (1934), No. 4, pp. 505–519, figs. 18*).—Studies conducted at the National Research Laboratories at Ottawa are reported in which commercial aviation and automotive gasolines were used.

The results show that absolute ethanol and gasoline mix in all proportions, and mixtures containing from 10 to 40 percent of absolute alcohol are stable at temperatures down to −60° C. or lower. Nevertheless, the addition of a small percentage of water to these mixtures will cause separation into two phases. The critical water content is small at low temperatures, and for mixtures containing from 10 to 40 percent alcohol it varies from 0.1 to 1 percent by volume at −40°. The water tolerance of a given ethanol-gasoline mixture can be raised by the addition of a third liquid or blending agent.

Benzene may be used to increase moderately the critical water content of ethanol-gasoline mixtures by substituting benzene for part of the gasoline. If the alcohol is of a strength less than 97 or 98 percent by weight, a slight increase in water tolerance may be obtained by replacing part of the alcohol in the formula by benzene. This is true only if the mixture contains less than 90 percent of gasoline. The existence of optimal ratios of benzene to ethanol for maximum water tolerance has been demonstrated. While benzene has other properties which make it desirable as a component of mixed motor fuels, its effect in increasing water tolerance appears to be too slight to be of practical value.

On the other hand, isopropanol increases the water tolerance and the critical water content of any ethanol-gasoline mixture to which it is added. If half of the ethanol in a given formula is replaced by isopropanol, the critical water content at −20° is increased by about 60 percent, while at −40° it is nearly doubled. Although there is no information available as to the degree of water tolerance desirable in mixed motor fuels, the results given above indicate that mixtures of reasonably high water tolerance may be prepared by the addition of isopropanol to ethanol-gasoline blends

High-speed belt drives, C. A. Norman (*Ohio Engin. Expt. Sta. Bul. 83 (1934), pp. IV+31, figs. 27*).—This is a report of a theoretical and experimental investigation of the performance of modern rubberized belts, with particular reference to their use for power transmission from high-speed motors, such as electric motors, and to high-speed machinery, such as grinders, blowers, hammer mills, corn shellers, and other such equipment.

In this study a German formula for centrifugal force was rederived and expanded to cover the influence of belt stiffness and varying shaft distance. Also, a formula was derived for the influence of stiffness on contact angle. Both the centrifugal force formula and the stiffness formula were checked experimentally.

Tests on idling losses show these to be comparatively more serious for V-belts than for flat cord belts. On small pulleys, particularly at reduced load, the idling losses may result in a comparatively low efficiency for V-belts. These can be run quite slack, however, while the flat cord belts must be run very tight to transmit a power commensurate with their cord strength.

An effort is made to draw conclusions from the relations of theoretical creep and measured creep as to the effectiveness of the arrangement of the cord section. A rather clear relation seems to exist. On the other hand, the relation

between cord section arrangement and life is not so clearly established. It is evident that in this respect the arrangement of the cord section is not the only influence.

Investigation with pneumatic rubber tires on binder drive wheels [trans. title], G. Preuschen and H. J. von Zieten (*Technik Landw., 15 (1934), No. 10, pp. 228–230, figs. 6*).—Studies conducted at the Technical Laboratory at Landsberg in Germany are briefly reported in which both horse and tractor binders were used.

It was found that the use of rubber tires offered no difficulties either on the tractor- or horse-drawn binder. By the selection of the correct tire size it was possible to lower the rolling resistance of the drive wheels by 50 percent. In that connection the depth of the tire was less important than the width, which should vary between 200 and 250 mm (7.8 to 9.7 in.), according to the weight of the binder. It was possible to avoid excessive slippage by lowering the air pressure within the tires. The draft data indicate a small but apparently not very significant decrease in draft due to the rubber tires.

A study of users' experiences with rubber-tired farm tractors, C. W. Smith (*Agr. Engin., 16 (1935), No. 2, pp. 45–52, figs. 14*).—This is a report of a committee of the American Society of Agricultural Engineers on agricultural wheel equipment. It summarizes the results of a questionnaire survey of farmer users of rubber-tired tractors, and is based upon 686 replies. While no conclusions are drawn, the impression is left that increased use of tractors and increased fuel savings in general accompanied the use of pneumatic tires. Apparently also the consensus of opinion among the users reporting was that rubber tires on tractors resulted in more work, greater drawbar power outfit, easier riding, greater flexibility, less wear on tractors and machines, and decreased repairs.

Nebraska tractor tests, 1920–1934 (*Nebraska Sta. Bul. 292 (1935), pp. 40*).—This bulletin summarizes the results of 81 of the 221 tractor tests conducted during the past 15 yr., and includes data on all tractors reported by their manufacturers as on the market January 1, 1935 (E. S. R., 70, p. 691).

General procedure used and rules followed in testing tractors are outlined, and the text of the farm tractor rating code of the American Society of Agricultural Engineers and the Society of Automotive Engineers is presented, together with the text of the Nebraska tractor testing law.

Power for the grindstone, H. N. Colby and W. T. Ackerman (*New Hampshire Sta. Circ. 43 (1935), pp. 6, figs. 4*).—The results of a study are reported which indicate that ⅛ hp. is ample to drive a grindstone for the average farm sharpening operations. The speed should not exceed 60 r. p. m. unless the stone is kept perfectly true. A speed of 48 to 50 revolutions proves more satisfactory for the average grindstone which is not perfectly round. The belt and direct gear driven units are more statisfactory than the combination gear-and-chain unit. The stone should be not less than 2.5 in. in thickness, and should be discarded when worn to 12 in. in diameter, as a smaller stone does not do the work as fast as a larger one nor does it allow necessary freedom of motion. For efficient work, the stone should be between 22 and 30 in. in diameter, preferably nearer 30, and should be trimmed occasionally to maintain a smooth, true working surface. For most economical operation, the grindstone should not run in a trough containing water, as the constant soaking will cause rapid wear. Water should be allowed to run on the stone from a spout leading from a substantial container mounted at one end of the grindstone frame, the flow being controlled by a drain cock on the spout.

Detailed plans are included for the construction of the gear-driven stone found most efficient.

Data from the plowshare control activities of the German Agricultural Society [trans. title], W. KLOTH, G. SCHMIDT, and H. LISCHKE (*Technik Landw., 15 (1934), No. 12, pp. 273–280, figs. 32*).—Data on the chemical composition, hardness, heat treatment, and other metallurgical characteristics of plowshares manufactured by German implement manufacturers during the years 1931 to 1934, inclusive, are presented and discussed.

Special attention is devoted to the relation between hardness and other qualities of durability with metallurgical composition with reference to such factors as carbon, silicon, manganese, phosphorus, and sulfur contents.

Investigations on disk harrows [trans. title], O. FREIBERG (*Technik Landw., 15 (1934), No. 9, pp. 200–203, figs. 5*).—The results of studies of tractor-drawn disk harrows with working widths of from 2.15 to 2.80 m (7.05 to 9.18 ft.), number of disks from 28 to 36, and disk diameter of 16 in. are reported. The results were related to the dynamic properties of the test soils.

The increasing draft with increasing angle of inclination of the disks was attributed to the increased specific pressure of the soil per unit area of disk. With the disks tested, the optimum angle of inclination was 17°. This angle was found to be determined by radius of curvature and the diameter of the disk. The draft increased with the weight and loading of the disk harrow. This is attached primarily to the physical composition of the soil since the draft increased with an increase in the proportion of fine particles in the soil and with higher moisture content.

The draft of disks of larger diameter was smaller than that of disks of smaller diameter but having the same radius of curvature, although the working width of the disks increases with their diameter. The draft increased around 5 percent for every 1 percent increase in soil moisture content.

The weight of the disk harrow was found to be an important factor in the efficiency of its performance. Large disks wtih large curvature performed less efficiently than smaller disks with smaller curvature.

It was found that rapid, more shallow disking gave better tillage results than slow, deeper disking.

Machinery in vegetable production, S. J. WRIGHT (*Sci. Hort. [Wye, Kent, Eng.], 3 (1935), pp. 97–108, figs. 12*).—Machines used in England are described.

Fruit tree spraying equipment, J. TURNBULL (*Sci. Hort. [Wye, Kent, Eng.], 3 (1935), pp. 24–32*).—Equipment used in England is described.

Statistics of farm machinery [trans. title], W. STAUSS (*Technik Landw., 15 (1934), No. 12, pp. 271–273, figs. 2*).—Statistical data on the number and acreage distribution of seeding and mowing machines in the different provinces of Germany during the years 1907, 1925, and 1933 are presented and discussed.

A progress report on the investigation of the various uses of electricity on the farms of Washington for the year 1934, L. J. SMITH and H. L. GARVER (*[Pullman]: Wash. Com. Relat. Elect. Agr., 1935, pp. 31, pls. 3*).—The Washington Committee on the Relation of Electricity to Agriculture here reviews 10 yr. of progress of the committee and presents reports on studies of potato and root washers, dairy refrigeration, soil sterilization, pasture irrigation, and fruit and vegetable processing. The experimental root crop washer developed in the studies is described and illustrated.

In the soil sterilization experiments it was found that no definite statement can be made setting forth the power demand for a given electrode spacing with soil at any given moisture condition.

It was noted that a uniformly positive contact over the entire surface of the heating electrodes is essential to uniform soil sterilization. A definite knowledge of the kind of organisms that are contained in soil should be obtained before the sterilizing is started. The experimental beds were filled with chrysanthemums and their growth and general appearance was noted. The plants in the unsterilized sections grew more rapidly at first, but after a few weeks were overtaken by those of the sterilized sections. There was no noticeable difference between the plants at harvest time except that those growing in the sterilized soil were of somewhat darker green. No difference was noted in the flowers.

Electric heat in gardening [trans. title], KIND and REINAU (*Reichskurator. Tech. Landw. Schr., No. 52 (1934), pp. 91, figs. 26*).—This is a technical treatise on the use of electricity in greenhouses, hotbeds, and the like, the data being drawn from various studies and instances of practical experience in Germany.

Considerable space is devoted to the heat requirements of greenhouses, forcing beds, and hotbeds, and the manner in which electricity can be adapted for this purpose. A large amount of electrotechnical information is included on electrical equipment for various purposes and its correct use.

Electric brooders (*Rural Electrif. and Electro-Farming, 10 (1934), No. 115, pp. 222–224, figs. 4*).—Practical information is given on the subject from English sources.

Electric brooders on Indiana farms, T. E. HIENTON (*Indiana Sta. Circ. 187, rev. (1934), pp. 4, figs. 2*).—This is a revision of this circular (E. S. R., 67, p. 303), additional data being included.

Some common construction errors and how to prevent them, O. G. KNECHT (*Amer. Builder and Bldg. Age, 56 (1934), No. 11, pp. 34, 35, 57, figs. 12*).—Common errors in construction and their remedies are described and illustrated.

Practical farm buildings (*Natl. Plan Serv., [1934], pp. 64, figs. 159*).—This pamphlet contains what are described as the latest and most modern ideas pertaining to the planning and construction of every type of farm building. Many of the plans featured in the book have been secured from 15 of the middle western agricultural experiment stations.

Homestead houses (*U. S. Dept. Int., Div. Subsist. Homesteads, [1934], pp. III+72, figs. 36*).—This booklet contains a collection of plans and perspectives of houses designed by the Division of Subsistence Homesteads of the U. S. Department of the Interior and by associated private architects, together with general information on subsistence gardening or part-time farming.

Remodeling the square house, J. C. WOOLEY and F. CLARK (*Missouri Agr. Col. Ext. Circ. 320 (1935), pp. 4, figs. 4*).—Practical information and working drawings are presented.

AGRICULTURAL ECONOMICS

Disproportionate subclass numbers in tables of multiple classification, G. W. SNEDECOR and G. M. COX (*Iowa Sta. Res. Bul. 180 (1935), pp. 233–272*).—The problem of disproportionate subclass numbers is discussed. The available methods for analyzing the variance in data with disproportionate subclass numbers—fitting constants, weighted squares of means, and unweighted means—and a new method—expected subclass numbers—are discussed, with special attention to the postulates upon which each is based and illustrated. The new method "is based on the assumption that the population from which the sample is drawn really has proportional subclass numbers, the disproportionate numbers in the sample being attributable to the accidents of sampling. The method is available only if every subclass contains at least one observed value."

Another postulate is that of equal subclass numbers. The results with the several methods are compared and discussed, and suggestions are made for using each method. Appendixes illustrate the method of expected subclass numbers applied to a table with three criteria of classification and the general method of fitting constants in a two-way (5 by 9) table.

From the study the authors conclude that (1) very satisfactory amounts of information can be extracted from tables of multiple classification with disproportionate subclass numbers. The results of the experiments varied no more than would be expected in simple sampling with eqnal or proportional numbers. (2) The various available methods usually yield much the same results. (3) Each method is based on a postulate concerning a population. If it is reasonable to suppose that the sample was derived from a popnlation described by one of these postulates, then the corresponding method of treatment can be used wtih greater confidence than otherwise. (4) So far as the reported experimental results are representative, the usual methods of testing significance are applicable even when the subclass numbers are disproportionate.

The methods in order of ease of computation have the following sequence: Unweighted means, excepted subclass numbers or weighted squares of means, and fitting constants.

[Papers presented at the twenty-fifth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 17 (1935), No. 1, pp. 1–175, fig. 1*).—Included are the following papers with discussions thereon presented at the meeting held at Chicago, Illinois, December 26–29, 1934: AAA as a Force in Rocovery, by J. S. Davis (pp. 1–19, fig. 1); Planning, Control and Research in Agriculture after Recovery, by J. D. Black (pp. 20–38); The Report on Land of the National Resources Board, by M. L. Wilson (pp. 39–54); Program of the Federal Government for the Purchase and Use of Submarginal Land, by C. F. Clayton (pp. 55–66); Part-time Farming near Industrial Areas, by K. Hood (pp. 67–75); Measures for the Relief and Rehabilitation of Agricultnre in Canada, by J. F. Booth (pp. 76–88); The Program of Rural Rehabilitation of the FERA, by L. Westbrook (pp. 89–100); Economic Bases and Objectives of Public Regulation of the Milk Industry, by W. C. Waite (pp. 101–108); Milk Control Experience—Results and Problems of Federal and State Regulation, by R. B. Corbett (pp. 109–132); The Outlook for Future Developments in Milk Control, by E. W. Gaumnitz, W. H. Bronson, M. C. Bond, and H. C. Grant (4 papers) (pp. 133–152); Cooperatives the Pace-setters in Agriculture, by H. E. Babcock (pp. 153–156); Cooperative Buying of Farm Supplies, by Q. Reynolds (pp. 157–166); and Financing Cooperatives, by J. E. Wells, Jr. (pp. 167–175).

Research in progress in the Bureau of Agricultural Economics, July 1, 1934 (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. [1]+II+79*).—This is a mimeographed list of the 220 research projects in the Bureau in progress on July 1, 1934. The title, objective, personnel, cooperation, and probable date of completion are given for each project.

[Investigations in farm management by the Indiana Station] (*Indiana Sta. Rpt. 1934, pp. 37–41, fig. 1*).—Brief summarization is made of the findings in studies on farm adjustments in central Indiana, farm management changes to meet corn borer conditions, use of combines, costs of farm power, crop practices, soil type as a factor in economic land use, tax delinquency, land transfers, the nonfarming rural population, economic effects of the back-to-the-land movement in southern Indiana, and costs and incomes of local elevators.

Agricultural conditions [on the Newlands (Nev.) reclamation project], E. W. Knight (*U. S. Dept. Agr., Tech. Bul. 464 (1935), pp. 5–10*).—These pages

present data obtained in cooperation with the Nevada Experiment Station, including tables showing by years, 1912–32, the acreages of principal crops, acreages in alfalfa, grain, miscellaneous crops, and pasture as percentages of entire cropped acreage, percentages cropped acreages were of irrigated area, and number of different kinds of livestock, poultry, rabbits, and hives of bees (*1914–32*).

[Investigations in agricultural economics by the New Jersey Stations] (*New Jersey Stas. Rpt. 1934, pp. 7–9*).—Findings are reported briefly on farm management surveys of the poultry industry in Cumberland and Ocean Counties, the costs of production in the dairy industry and for onions, tomatoes and beets for canning, sweetpotatoes, and rye, and the costs of farm power.

[Investigations in agricultural economics by the New Mexico Station] (*New Mexico Sta. Rpt. 1934, pp. 10–14*).—Results of investigations not previously noted are reported as follows: Tables show the yield and cost per acre in 1933 of growing and harvesting apples, potatoes, sweetpotatoes, onions, and tomatoes in 12 areas of the State, and the average number of irrigations, total cost, and cost for fuel and oil for different crops on 25 farms in the vicinity of Portales irrigated by pumping.

Current farm economics, Oklahoma [February 1935] (*Oklahoma Sta., Cur. Farm Econ., 8 (1935), No. 1, pp. 22, figs. 3*).—Included are reviews of the general agricultural situation, by L. S. Ellis, the dairy situation, by A. W. Jacob, the poultry situation, by H. A. Miles, the wool situation, by R. A. Ballinger, and the beef cattle situation, by P. Nelson. Articles are included on Effect of Homestead Exemption on the Property Tax Base of Stillwater, Oklahoma, and Chattel Mortgage Credit in Payne County, Oklahoma, by Ellis; and on Recent Changes in the Relief Situation in Oklahoma, by O. D. Duncan.

A method of rural land classification, C. E. KELLOGG and J. K. ABLEITER (*U. S. Dept. Agr., Tech. Bul. 469 (1935), pp. 30, figs. 5*).—"This bulletin discusses the general requirements of a method of land classification and presents an example of the method developed and used in western North Dakota. . . .

"For purposes of tax assessment, land classification must be detailed and clearly indicate any significant differences between social land units. The procedure for reaching this objective may be summarized under four general steps: (1) Accurate mapping (in detail) of the important physical features of the land, (2) the determination of the natural productivity of each important combination of these physical features (the natural land type), (3) the determination of the use group, or combination of use groups, to which the various social land units belong, and (4) the evaluation or rating of each individual tract of land according to its capabilities within its use group."

A production method of valuing land, W. G. MURRAY and H. R. MELDRUM (*Iowa Sta. Bul. 326 (1935), pp. 313–335), figs. 7*).—A method of determining a valuation for land based on (1) an examination of soil types, drainage, topography, and erosion conditions, (2) an estimation of future yields and production based on the first part of the appraisal, and (3) an evaluation of the use of the buildings to the farm, is discussed and illustrated.

Land policy: Report of committee (*Washington, D. C.: Chamber Com. U. S., 1934, pp. 42*).—Included are the recommendations of the Special Committee on Land Policy of the Chamber of Commerce of the United States on the approach to a sound land policy, land classification, adjustment of agricultural production to demand, conservation of soil resources, the marginal land problem, forestry, the public domain, Federal reclamation, land settlement and colonization, and land-use planning.

Studies in agricultural finance, G. Lundy (*South Dakota Sta. Rpt. 1934, pp. 6–9*).—In addition to findings regarding the farm real estate mortgage situation in selected counties of the State and the farm mortgage experience of life insurance companies doing business in South Dakota previously noted, a table is included showing for each fifth year 1900–1930 and for 1933 the number and total resources of national and State banks in South Dakota. Data are also given regarding the percentage of total resources invested in stocks and bonds and the percentage expenses were of total resources in State banks in 1932.

Tax delinquent farm land in Iowa, R. C. Bentley and J. P. Himmel (*Iowa Sta. Bul. 325 (1935), pp. 281–312, figs. 8*).—Tables and charts show, by years 1929 to 1933, for the counties of the State, type-of-farming areas, or selected counties, data as to delinquent farm land taxes, tax sales, outstanding delinquent taxes, etc. The apparent economic relations bearing on the amount, character, and geographical variations in tax delinquency are set forth and commented on.

Comparative figures for 1929 and 1933 were for farm lands involved in delinquencies 4,000,000 and 12,000,000 acres, farm real estate taxes delinquent less than $3,554,000 and over $10,374,000 (in 1932 over $11,674,000), and outstanding delinquency on new tax list books less than $72,300 and over $5,406,000. The percentage taxes were of gross farm income increased from 16–20 in 1928 to 38–40 in 1932 and the percentage assessed valuation was of farm real estate value from 45–52 to 66–75. The delinquency problem was most acute in the north central and Missouri Valley cash grain areas and the southern pasture area, least acute in the dairy section, and intermediate in the livestock feeding areas.

Farm taxes and local government in Crittenden and Livingston Counties, Kentucky, T. B. Manny, B. W. Allin, and C. J. Bradley (*Kentucky Sta. Bul. 355 (1934), pp. 269–337, fig. 1*).—This study, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, includes a summarization and analysis of the conditions, methods, and policies prevailing in May and June 1933 as regards taxation, revenues, expenditures, and indebtedness in the two counties. One hundred and sixty-two farmers were interviewed regarding the local government and its problems, and group-discussion meetings attended by leading citizens representing farming, trade and commerce, mining, the professions, and homemaking were held to discuss the principal problems of county government.

The area, its development, and population trends, county government, taxation systems, etc., are described. Analysis is made of the county revenues, expenditures, and indebtedness and of school finances of the two counties. The opinions of citizens regarding local government are summarized and discussed. A number of suggestions are made for improving the county government of the two counties.

Possible farm tax reduction through changes in local government, G. S. Wehrwein and B. W. Allin (*Wisconsin Sta. Spec. Bul., 1934, Apr., pp. 17*).—This is a mimeographed preliminary report based upon a detailed study, made by the Bureau of Agricultural Economics, U. S. D. A., and the station, of county, township, city and village, and school district organization, revenues, and expenditures of Washburn County, Wisconsin, and a less detailed study of the adjoining counties (Burnett and Sawyer).

Tax revenue sources for the State Government of Maryland, W. P. Walker and S. H. DeVault (*Maryland Sta., 1935, pp. 24+[1]*).—This preliminary mimeographed report briefly discusses the existing State tax revenues and the

advantages, disadvantages, and estimated revenues that could be expected from net and gross income taxes, a general retail sales tax, and special commodity taxes.

Present-day taxation problems with regard to privately owned forests in Europe, G. Luncz (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Sci. and Pract. [Rome], 25 (1934), No. 12, pp. 545–553*).—The most characteristic features of the laws of the several countries are given and comments made on experiences thereunder.

[Outlook charts] (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, [1], pp. [4]+28, figs. 28; [2], pp. [4]+41, figs. 41; [3], pp. [4]+28, figs. 28; [4], pp. [3]+18, figs. 18; [5], pp. [4]+24, figs. 24; [6], pp. [4]+34, figs. 34; [7], pp. [4]+21, figs. 21; [8], pp. [3]+19, figs. 19; [9], pp. [3]+21, figs. 22; [10], pp. [3]+19, figs. 19; [11], pp. [3]+21, figs. 21; [12], pp. [3]+25, figs. 25; [13], pp. [4]+32, figs. 32*).—This series of charts for use with the agricultural outlook report previously noted (E. S. R., 72, p. 548) includes charts on (1) sheep, lambs, and wool, (2) fruits—apples, citrus, peaches, etc., (3) demand, credit, prices, (4) corn, oats, barley, rye, and flax, (5) wheat, (6) potatoes and truck crops, (7) rice, peanuts, soybeans, dry beans, and broomcorn, (8) poultry and eggs, (9) hogs, (10) tobacco, (11) cotton, (12) beef cattle, and (13) dairy products.

A study of certain aspects of Corn Belt agriculture in order to determine suitable policy for production reduction.—Progress reports I, II (*Ames: Iowa State Col., 1934, Nos. 1, pp. [1]+27, figs. 5; 2, pp. 206, figs. 7*).—These mimeographed reports are the first and second progress reports prepared for the Division of Program Planning of the U. S. D. A. Agricultural Adjustment Administration.

No. 1, by R. Schickele, J. A. Hopkins, and T. W. Schultz, presents (1) a detailed analysis and economic appraisal of the existing crop and livestock systems of Iowa under sections dealing with the existing systems by counties, the establishing of a measure of crop land and pasture productivity in terms of feed units, commercial movement of corn and oats, type of farming information, information on livestock systems, farm price structure, and developing criteria for typical patterns of specific enterprises and whole farming set-ups; (2) a comparison of existing crop and livestock systems with those recommended by the crops and soils and animal husbandry specialists of the college; and (3) the recommendations of the crop and soil and animal husbandry sections and the adjustments made after these recommendations are completed.

No. 2 includes reports as follows: The problem of soil conservation—(1) the determination of a desirable cropping system for Iowa, by townships and counties, on the basis of soil types and suitable soil management practices, summary report by F. B. Smith, J. B. Firkins, and C. S. Dorchester, (2) agronomic report on Corn Belt farming areas west of the Mississippi outside of Iowa, by R. H. Walker and B. J. Firkins, and (3) outline of a plan to facilitate the consolidation of farms subject to erosion, by J. A. Hopkins; probable changes in the livestock system of Iowa, resulting from the cropping systems recommended by the crops and soils specialists, by C. C. Culbertson and C. Y. Cannon; estimated effects of a feed grain production control program on Iowa crop and livestock systems and farm income, by R. Schickele, T. H. Cox, and E. Hole, with sections on the differential feed grain acreage reduction in Iowa and the effect of recommended feed grain reduction on the farmer's budget; analysis of the relative economic positions of the various feed and small grains in the Midwestern States, by R. Schickele, K. Kirkpatrick, and E. Hole, with sections on method of procedure, the main grain-producing areas in the Middle West, comparison of value per acre of feed and small grains, by States and selected counties, and a comparison of feed unit production per acre of feed grains and

replacement crops (oats and hay), by States and selected counties; and general issues involved in the shaping of a production control program for the Middle West, with sections on alternatives arising out of the present feed and livestock adjustment program and a tentative outline of alternative feed and livestock adjustment programs.

The facts about wheat (*U. S. Dept. Agr., Agr. Adjust. Admin., Commod. Infor. Ser., Wheat Circ. 1 (1935), pp. III+28, figs. 8*).—"This publication is intended to give a brief summary of the pertinent economic facts in the wheat situation of the United States and of the world. It incorporates a review of the 1933–35 wheat program, as that program relates to the current wheat situation, and the future of wheat production adjustment."

The economics of cereals in Italy and the world, G. Acerbo (*La Economia dei cereali nell'Italia e nel mondo. Milano: Ulrico Hoepli, 1934, pp. IX+1021, figs. 5*).—This volume describes and discusses the evolution and present situation of the production and consumption of and trade in cereals in Italy and the world, and the agricultural and commercial policies related thereto.

The hop industry, H. H. Parker (*London: P. S. King & Son, 1934, pp. IX+327, [pls. 7, figs. 6]*).—The development of the industry, present-day problems of production, research work, the economics of the industry in England, the status of the industry in the principal producing countries, the recent attempts at cooperative marketing, and the principles and problems under the new English marketing schemes are discussed.

The consumption of fluid milk and other dairy products in Philadelphia, Pennsylvania, June 1934, T. K. Cowden and A. Sturges (*Pennsylvania Sta., 1934, pp. [2]+45, figs. 3*).—This is a mimeographed preliminary report of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Data are included and discussed showing the consumption of different dairy products and butter substitutes, the factors affecting the consumption of dairy products, milk drinking habits, merchandising fluid milk, and health education and advertising programs. Comparisons are made with studies made in 1924 and 1929 (E. S. R., 63, p. 284).

Agriculture's interest in America's world trade: Questions and answers on a vital aspect of America's future (*U. S. Dept. Agr., Agr. Adjust. Admin., 1935, pp. [1]+V+22, fig. 1*).—This pamphlet, made up of 55 questions and answers prepared by the Agricultural Adjustment Administration, "deals with agriculture's interest in world trade [and] indicates why it is that we must dig so deep to restore purchasing power both to the American farmer and the American consumer."

The direct marketing of hogs (*U. S. Dept. Agr., Misc. Pub. 222 (1935), pp. IV+230, figs. 36*).—This report includes chapters discussing the growth and present status of direct marketing of hogs; the regional shifts and changes in corn and hog production, in receipts at public markets, and in hog slaughter; the relations of transportation methods, rates and privileges, and differences in wage costs in the packing industry to direct marketing; market agencies, their functions, methods, and practices; grade standards and marketing news; factors affecting hog prices; the competition of different types of markets and its effects on prices; the price differentials between markets and the relationships between receipts and prices at different markets; the effect of direct marketing on the quality of hogs at public markets; the costs of marketing direct and at public markets; and the relationships of prices paid for hogs bought direct and at public markets. Recommendations are made for the correction of some of the practices in hog marketing in general and for providing additional marketing services.

The study shows among other things that (1) the growth of direct marketing of hogs and other livestock is due to causes closely associated with the economic development of the country and particularly of the livestock industry, (2) direct marketing has not restricted competition among slaughterers and distributors and enabled them to exact a wider margin, (3) no one market or type of market sets the level of hog prices for all markets, (4) the distribution of the hogs consigned to public markets among the different grade classifications is approximately the same as that for hogs marketed direct, (5) the growth of direct marketing has not impaired the price-registering function of the public markets, nor caused prices at interior points to be lower than if direct marketing had not increased, (6) the growth of direct marketing has not been to the disadvantage of hog producers, and (7) there is need for correction of some marketing practices and the development of additional services to improve the marketing of hogs.

Recommendations made are as follows: (1) The method of pricing hogs at certain direct-buying points by means of a posted "board" price with an unnamed variable "add" should be modified or replaced by a method making generally known the prices offered and paid for different grades; (2) the practice of "filling" hogs before selling at all markets should be discontinued, except when advisable for humanitarian reasons; (3) the practice of docking "piggy" sows and stags should be eliminated, and sales should be made on merit at actual weights; (4) scale facilities and weighing at interior marketing points should have such supervision as will assure sellers that their interests are fully protected; (5) uniform grade standards should be adopted in all markets; and (6) the Federal Market News Service should be strengthened and extended to important direct marketing areas.

Trading in privileges on the Chicago Board of Trade, P. MEHL (*U. S. Dept. Agr. Circ. 323 (1934), pp. 80, figs. 4*).—A brief history of early privilege trading is given. Analysis is made chiefly for the period January 3 to October 31, 1927, of the volume of such trading, total and by large speculators, the distance privileges sell from the closing prices of futures and the factors determining such distance, the privilege market as a forecaster of daily price movements of futures, the frequency with which privileges are made good for the market as a whole and for 29 large speculators, the volume of transactions in futures arising out of privileges exercised for the market as a whole and for the accounts of the 29 large speculators, the spreads at which privileges were made good, and the factors determining the profitableness of such trading. The uses made of privileges and the unfavorable aspects of such trading are discussed.

Privilege trading is equivalent to about 15 percent of the trading in grain futures. Such trading is usually for the account of speculators. The general public are for the most part buyers and the large speculators principally sellers. Privileges are not used extensively by merchandisers of grain or grain products. About 75 percent of the time privileges sell at 1 to 2 ct. from the closing price of the future. As a forecaster of the next day's price trend, the privilege market was correct only 63 percent of the time. The 29 large speculators were correct 73 percent of the time. Privileges good for 1 day are exercisable on the Chicago Board of Trade about once in every 4 or 5 days. For the average individual they were good not more frequently than 1 day in 6 or 7. More than 50 percent of the time that privileges are good the gross profit is ⅝ ct. or less per bushel.

Privilege trading is considered useful by many members of the grain trade in that it affords protection against price changes, makes possible the financing of speculative transactions on a small capital, is a source of profit to some indi-

viduals, provides for the large speculator a means of getting in and out of the market under cover, and has a stabilizing influence on the price of futures.

The unfavorable aspects are that the small amount of capital required encourages speculation by traders of limited financial resources, the practice of such trading causes artificial price movements, and the making of offsetting trades at the close of the futures market by buyers of privileges who are taking profits and by sellers who are taking losses adds to the congestion at the close occasioned by scalpers' "evening up" for the day and the execution of orders to buy or sell "at the close."

Missouri farm prices for 25 years, D. R. COWAN and F. L. THOMSEN (*Missouri Sta. Res. Bul. 221 (1935), pp. 24*).—This bulletin is a continuation of that on Missouri Farm Prices and Purchasing Power previously noted (E. S. R., 55, p. 589). Tables show for the years 1910–34 the monthly prices and the indexes of such prices (average monthly price January 1910–December 1914=100) of hogs, cattle, sheep, calves, horses, chickens, eggs, butterfat, corn, wheat, oats, hay, and apples, and the monthly indexes of farm prices (weighted index of the 13 commodities).

Factors affecting strawberry prices, F. L. THOMSEN (*Missouri Sta. Bul. 347 (1935), pp. 8, figs. 5*).—This bulletin supplements that previously noted (E. S. R., 60, p. 678). Analyses are made for the period 1922–34 of (1) the effect on strawberry prices of changes in production and consumers' income in the United States, (2) the trends of acreage and price, (3) the factors causing prices to vary in different producing areas, and (4) the relation between production and gross income.

Statistics relating to agriculture (*Washington, D. C.: Amer. Statis. Assoc. and Social Sci. Res. Council, 1934, pp. V+97*).—This memorandum of the Committee on Government Statistics and Information Service to the Secretary of Agriculture describes the types of statistical and informational work in the Department of Agriculture and discusses improvement in accuracy and geographic detail of data on acreage and production collected by the Bureau of Agricultural Economics, the present status and further need for data on prices paid by farmers for supplies and other products and received for agricultural products, the movement of agricultural products, incomes of farm people, and agricultural credit. The problems of interagency relationship in agricultural statistics and types of data in need of further study are also discussed.

Crops and Markets, [February 1935] (*U. S. Dept. Agr., Crops and Markets, 12 (1935), No. 2, pp. 33–72, figs. 3*).—Included are the market reports on livestock and livestock products, dairy and poultry products, cold storage holdings, grain, hay, feed, seeds, fruits and vegetables, and cotton, a discussion of the price situation, charts showing price movements of important agricultural products, tables showing by States the number of different kinds of livestock on farms and farm value on January 1, 1933, 1934, and 1935, and an article on the cost of producing field crops in 1933.

Revised estimates of tame hay acreage, yield and production, 1866–1929 (*U. S. Dept. Agr., Bur. Agr. Econ., 1934, pp. 56*).—Tables show by States and geographic divisions by years the acreages, yields, and production of tame hay.

RURAL SOCIOLOGY

Economic and social problems and conditions of the Southern Appalachians (*U. S. Dept. Agr., Misc. Pub. 205 (1935), pp. II+184, map 1, figs. 225*).—This study, made by the U. S. D. A. Bureaus of Agricultural Economics and Home Economics and the Forest Service in cooperation with the Office of Educa-

tion, U. S. Department of the Interior, and the State agricultural experiment stations of Tennessee, Virginia, West Virginia, and Kentucky, "had its origin in the desire of a number of agencies interested in the welfare of the people of the Southern Appalachians for a comprehensive survey of present economic and social conditions and tendencies in that region. Such a survey, it was felt, was essential to provide the various agencies with a basis for planning their programs." Following the introduction, by L. C. Gray and C. F. Clayton (pp. 1–6), reports on the findings are included as follows: Physical Features and Conditions, by F. J. Marschner (pp. 7–15); Types of Land Utilization, by L. J. Peet and R. V. Reynolds (pp. 15–40); Farm Organization and Management, by H. W. Hawthorne (pp. 41–72); Markets, Transportation, Manufactures, and Occupations, by H. B. Price (pp. 73–88); Problems of Public Finance and Farm Taxes, by D. Jackson (pp. 89–94); Schools and Education, by W. H. Gaumnitz, with a foreword by L. R. Alderman (pp. 95–119); Population Distribution and Changes, by T. B. Manny (pp. 120–136); Variations in Farm-Family Living, including farm dwellings, housing facilities, value of products furnished by the farm, etc., by F. M. Williams (pp. 137–152); Food Supply of Families Living in the Southern Appalachians, by H. K. Stiebeling (pp. 153, 154); Social Conditions and Social Organizations, including data on health conditions and facilities, marital conditions, crime, community and social organizations, libraries, etc., by W. E. Garnett (pp. 155–167); and The Church Situation, by E. R. Hooker (pp. 168–182).

Rural homes for non-agricultural workers: A survey of their agricultural activities, F. L. Morison and J. H. Sitterley (*Ohio Sta. Bul. 547 (1935), pp. 34*).—The data for this study were obtained from 202 families in the vicinity of Columbus, Ohio, of whom three-fourths derived but little income from the sale of farm products and one-fourth secured all of their cash from sources other than the farm. More than two-thirds of the holdings were less than 5 acres in size and 38 percent were under 2 acres. Tables show previous agricultural experience, age, occupational history, size of family, family income, length of tenure, etc., of the operators, size of homestead, amount and value of livestock and farm products, real estate investment, and operating expenses. The effects of size of homestead, size of family, previous farm experience, nonagricultural income, employment, and quality of soil on the agricultural activities of the wage and salary earners are discussed, and a brief summary is given of a part-time farm census conducted by the U. S. Department of the Interior in 1934 in 14 counties of Ohio.

The families produced only 38 percent of their total food bill. Sales exceeded $25 per household for less than 50 percent of the families. Low income families produced only a slightly larger part of their food supply than did the higher income groups. Those employed full time in nonagricultural occupations produced practically as high a percentage as those employed only part time. Families with 5 acres, a large garden, a cow, and chickens, and butchering a few hogs produced less than 60 percent of their food budget.

The findings did not support the claims (1) that practically all of the family's food can be produced on a small tract, or (2) that the public relief and unemployment problem would be solved to any extent by attempting to make farmers out of the urban unemployed.

Subsistence homesteads for industrial and rural workers at the end of 1934 (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 40 (1935), No. 1, pp. 19–37, figs. 3*).—The programs of the Subsistence Homesteads Division of the Department of the Interior and the Federal Emergency Relief Administration, projects under way, characteristics of individual homesteads, selection of families, population make-up and employment possibilities, etc., are described.

The modern settlement movement in Germany, C. P. Loomis (*U. S. Dept. Agr., Bur. Agr. Econ., 1935, pp. [5]+68, figs. 12*).—The historical background, governmental aims, origin of settlers and land settled, the carrying out of the settlements, and the social life in the rural settlements; and the objectives, legislation and appropriations for the settlements, the procedure for loans, choice of settlers, the securing of land, the problems in financing, and the results to date of the suburban settlement movement, are described and discussed.

Rural relief in South Dakota, with special attention to rural relief families under the New Deal relief program, P. H. Landis (*South Dakota Sta. Bul. 289 (1934), pp. 63, figs. 2*).—The relief situation in South Dakota, causing the expenditure of several millions of Federal funds and the depletion of local relief funds, is attributed to the drought primarily and only incidentally to the depression. Heads of relief families and their wives were younger than those of nonrelief families. A greater proportion of the relief families of the State were farm tenants, while the second largest group were formerly business men.

Relief families farmed on a smaller scale than nonrelief families, viewed both from the number of acres of land operated and the number of livestock raised, suggesting that livestock raising and larger land holdings in South Dakota are a safeguard in drought-depression. Relief families have decreased their indebtedness in smaller amounts than have nonrelief families. In important decreases in expenditures were included the use of automobiles, radios, telephones, newspapers, and magazines.

The coming of the Civil Works Administration program was the important factor in closing relief cases and the doing away with this program was the principal factor in the reopening of cases.

The study was made in cooperation with the Federal Emergency Relief Administration.

A study of selected factors in family life as described in autobiographies, M. B. Thurow (*[New York] Cornell Sta. Mem. 171 (1935), pp. 52*).—This is a study of the family, based upon 200 autobiographies of college students, mostly upperclassmen, of native and foreign-born parentage, not of the negro race. All biographies accepted for study were written by students both of whose parents were living with the children in a family relationship. The majority of these families appeared to be normally adjusted, i. e., few tensions existed between the various members. Parental relationships were more likely to be characterized by affection and cooperation than by conflict or tension. The high-school-trained parents were somewhat better adjusted than were those who had had college educations.

When the parents were in conflict with each other the child was, as a rule, unhappy in his relations with the members of his family. Likewise, he confided less in his parents and was much more likely to be dissatisfied with his family when such conflict existed. On the whole, these families were not very religious; 43 percent did not attend church and 49 percent had little, if any, religious observance in the home. Although there was little association between religious activity and other family relationships, the parents were somewhat better adjusted to each other, and the students were better satisfied with their families when these religious factors were present than when they were absent. The relationships between the parents and children were, in most families, characterized by tension when parental tension or father-dominance was present. Much discipline in the home was also associated with much tension between parents and children. Family counseling

seemed to favor wholesome relationships between the parents and children and also between the brothers and sisters. Sex instruction, although not commonly given in these families, was associated with increased confidence in parents and satisfaction in family pattern on the part of the child.

The most successful family was found to be characterized by little tension in the home, much family affection, much entertaining of friends and relatives in the home, much entertaining of children's friends in the home, husband and wife attending social functions together much, high school education or more for parents, much consensus of parents on discipline, little dominance of the father in the home, medium to much family counseling, preferably much, little to medium discipline in the home, preferably little, medium supervision of children's activities by both parents, and medium to much confidence of the children in the parents, preferably much.

The data in this study indicate that certain family relationships are more closely associated than others, and that they differ with the composition of the family, the environmental factors, and the training and personality of the members.

Interests, activities, and problems of rural young folk.—I, Women 15 to 29 years of age, M. B. THURow (*[New York] Cornell Sta. Bul. 617 (1934), pp. 57*).—This study covers personal interviews with 300 unmarried rural girls between the ages of 15 and 29 yr., living in Genesee County. The ages of 96 percent of these girls ranged from 15 to 20 yr. Those 21 yr. or older were either employed in some type of full-time remunerative work or looking for work and planning to leave the rural community when work was found. If something is to be done to keep the older girls in their local communities, it should be begun long before their twenty-first year.

Eighty-three percent of the girls were in regular school, 9 percent in part-time school, and only 10 percent out of school. Ninety-six percent had either finished high school or were planning to do so, while 78 percent were planning some type of training beyond high school. Girls were not choosing the farm as a place for future living.

It is concluded, in part, that "programs for young people should make them more and more independent, should satisfy more and more of their needs, and should anticipate and meet their needs."

FOODS—HUMAN NUTRITION

The practice of dietetics, L. H. NEWBURGH and F. MACKINNON (*New York: Macmillan Co., 1934, pp. IX+264, figs. 4*).—A distinctive feature of this volume, which has been written for physicians, medical students, and dietitians, is the section on diet therapy. In this section the principle of the method of constructing diets for the diabetic has been applied to the construction of diets for other diseases, with emphasis on chemical composition, calorific value, and physical form as three factors in which adjustments are called for in various diseases. Skeleton diets are given in illustration of the shifts which can be made in these three items to meet various requirements, the kinds of abnormality appropriate to diet therapy are tabulated, and general directions are indicated for diet selection for each of the abnormal states. In a separate chapter on the dietary control of diabetes mellitus, arguments are given for the high fat procedure followed by the authors. The final chapter on dietary treatment of renal diseases is contributed by F. H. Lashmet.

Food fads, H. GAUSS (*Hygeia [Chicago], 13 (1935), No. 3, pp. 210–212, 245, fig. 1*).—A popular discussion.

[Food and nutrition studies at the Florida Station], C. F. AHMANN, O. D. ABBOTT, L. W. GADDUM, W. M. NEAL, O. C. BRYAN, and R. C. WILLIAMSON (*Florida Sta. Rpt. 1934, pp. 57–60*).—This progress report (E. S. R., 72, p. 413) includes further results in studies on the relation of growth to phosphorus, calcium, and lipin metabolism as influenced by the thymus, lecithin synthesis in hens on a vitamin A- and lipoid-free diet, changes in the hematopoietic tissues of rats on a vitamin A-free diet, and the less common mineral constituents in the ash of citrus fruits. Preliminary observations are also reported on an investigation of human dietary deficiencies in Alachua County, Fla., with special reference to anemia in relation to the composition of home-grown foods, and the development of quantitative spectrographic methods for zinc. A brief report is given of a comparison of the table qualities of fresh and canned Snowflake corn and of sweet corn of ½ Snowflake ancestry.

[Food and nutrition studies at the Indiana Station] (*Indiana Sta. Rpt. 1934, p. 45*).—This progress report includes further data on oven canning (E. S. R., 71, p. 274) and a preliminary report of cooking tests with potatoes which had received different fertilizer treatments.

Analyses of meats, V. A. TOSCANI, V. R. RUPP, and W. S. MCCLELLAN (*Jour. Nutr., 7 (1934), No. 4, pp. 473–480*).—This paper contains the values for protein, fat, carbohydrate, calcium, and phosphorus, as reported previously (E. S. R., 64, p. 290), for meats used in the investigation of the metabolism of two men subsisting on an exclusive meat diet for a year (E. S. R., 67, p. 87). In addition the total ash and water content are given. The samples included beef muscle (well trimmed and not trimmed), tongue, liver, kidney, and brain, lamb muscle, and veal muscle.

Attention is called to the fact that in meat analyses carbohydrates are usually neglected. In the present study total carbohydrates were taken as the sum of hydrolyzable carbohydrate and lactic acid. From the data obtained it is estimated that the exclusive meat diet consumed by the men taking part in the investigation furnished as much as from 8 to 12 g of carbohydrate a day. Attention is also called to the low content of calcium in the meat and the higher values for phosphorus in liver and kidney as compared with other cuts.

[Food value of mottled gram bean (Phaseolus mungo)], T. Y. LO (*Natl. Univ. Peiping, Col. Agr., Dept. Agr. Chem., Nutr. Bul., Pub. Ser. B, Bul. 1 (1934), pp. 1–39, figs. 24*).—The data reported include proximate composition, protein distribution and biological value, and vitamin and mineral content of the mottled gram bean. On the basis of these data the mottled gram bean is considered to have a protein of low quality, to be a good source of vitamins A and B (complex), and to contain no vitamin C and a moderate amount of vitamin D. Of the mineral constituents, the bean is considered to be deficient chiefly in phosphorus and sodium chloride and rich in iron.

The biological availability of soybean carbohydrate, W. H. ADOLPH and H. C. KAO (*Jour. Nutr., 7 (1934), No. 4, pp. 395–406*).—Four methods were used in this study of the biological availability of the carbohydrates in soybeans and soybean products: "(1) Determination of reducing sugars after hydrolysis with takadiastase in vitro; (2) the formation of glycogen and determination of blood sugar level; (3) determination of extra glucose in phlorhizinized animals; (4) determination of the respiratory quotient. The last three in vivo methods were carried out using albino rats."

The materials tested included a yellow soybean (Peking variety) ground to pass through a 40-mesh sieve, the ground meal defatted in a Soxhlet apparatus and dried, and fat-free soybean curd prepared from locally purchased soybean curd or cheese. In the negative control diet in the in vivo tests, cellulose fiber prepared by digesting ordinary filter paper with boiling HCl was used.

The four methods gave values varying from 27 to 50 percent for the fraction of the total utilizable carbohydrate. The lowest value obtained was by the takadiastase method and the highest in the liver glycogen and respiratory quotient estimations. A consideration of the data from all of the methods has led to the conclusion that about 40 percent of the soybean carbohydrate is utilized by the animal body.

[Sweetpotato sirup], G. A. SHUEY (*Tennessee Sta. Rpt. 1933, p. 38*).—This progress report (E. S. R., 70, p. 272) discusses briefly the properties and uses of sweetpotato sirup and the use of sweetpotato juice with fruit juices for jelly making.

Microorganisms surviving the storage period of frozen-pack fruits and vegetables, H. F. SMART (*Phytopathology, 24 (1934), No. 12, pp. 1319–1331*).—The results are presented of 5 years' work on the microbiology of approximately 3,000 samples of frozen-pack fruits and vegetables contained in barrels, hermetically sealed tinned cans, glass jars, and paper containers, from the Pacific Northwest, from the eastern coast, and from the Louisiana district, held at 15° F. for periods of from 1 to 3 yr. Standard bacteriological technic was employed. The different species of bacteria and other organisms identified from the material are listed.

The microbial count of fresh strawberries from eastern, southern, and northwestern sources, after hulling and washing, ranged from 14,500 to 1,030,000 per gram, depending on the degree of ripeness and soundness of the fruit, and the efficiency of washing. After 1 yr. at 15°, in sealed tin cans and paper containers, the count was reduced, on the average, 99.3 percent, but among the survivors were 30 species of bacteria, 1 genus of yeast, and 7 genera of fungi. Many species survived 3 years' storage at 15°. No micro-organisms pathogenic to human beings were isolated, but several species from animal or human sources were found in fresh strawberries and in frozen-pack figs. Blackberries, cherries, figs, loganberries, raspberries, red currants, and tomatoes did not, on the average, show such a high count, after a year at 15°, as did green beans, beets, corn, mushrooms, lima beans, peas, and spinach. In some cases the count for lima beans, peas, and spinach exceeded a million.

The need for careful sanitary control during packing operations is pointed out.

Some observations on the storage of honey, C. H. GILBERT (*Amer. Bee Jour., 74 (1934), No. 10, pp. 437, 438*).—In this contribution from the Wyoming Experiment Station, tests are reported on the effect of different heating and storage temperatures on the color and granulation of honey. The honey used in the tests was taken from regular 60-lb. can stock, heated gradually to 130° F. until liquid, graded, and packed in 8-oz. jars which were then subjected to the various heating and storage treatments.

Unheated sirup granulated quite quickly in all cases. The higher the temperature of storage the coarser and darker were the crystals. Heated samples did not granulate as rapidly at temperatures of 29° and 46° as at 70°. After 3 years' storage some of the samples were still liquid, with some granulation at the sides and the bottom of the container. There was practically no color change in the sample stored for 3½ yr. at 29°, but the samples stored at 70° were quite dark.

The influence of roughage on protein digestibility, W. H. ADOLPH and M. Y. WU (*Jour. Nutr., 7 (1934), No. 4, pp. 381–393*).—Filter paper, China clay, and rice chaff fed to rats at different levels with a cooked rice diet were found to have no significant effect upon degree of digestibility of the rice protein even when fed in amounts producing great bulk in the gastro-intestinal tract. Agar caused a rapid passage of the food materials through the alimentary

tract, with distinctly lower values for protein digestibility. When cabbage fiber was fed in different amounts with a meat-rice diet to human subjects, a slight tendency toward a lowered degree of protein digestibility was shown only when the fiber was ingested in an abnormally large amount. "It is suggested that lowered values for nitrogen digestibility on a given diet result only when the food material passes through the alimentary tract with unusual rapidity."

The effect of heat upon the biological value of meat protein, A. F. Morgan and G. E. Kern (*Jour. Nutr., 7 (1934), No. 4, pp. 367–379*).—Following the same general plan as in an earlier investigation of the cereal proteins (E. S. R., 65, p. 789), the authors have studied the effect of boiling at ordinary and increased pressures on the biological value of beef muscle for maintenance and for growth in rats.

The biological values for maintenance for the beef protein at a 7 percent level were raw 67, boiled at ordinary pressure to an internal temperature of 85° C. 60, boiled for 7 min. at 15 lb. pressure 62, and boiled for an hour at 15 lb. pressure 56. In young rats fed the same rations for 6 weeks, the gains in body weight per gram protein eaten were 2.58±0.04 g for the raw beef, 2.41±0.06 for the boiled, 2.44±0.06 for the autoclaved 7 min., and 1.80±0.05 g for the autoclaved 1 hr. preparation.

"Attention is drawn to the discrepancy between the high values for growth of the beef protein, parallel with the best values obtained on other animal proteins, and the lower values for maintenance shown by the biological values, parallel with casein and the cereal proteins. This may be due to sharp differences between the mechanisms of the endogenous protein metabolism of growth and maintenance."

Feeding experiments with mixtures of highly purified amino acids.—VI, The relation of phenylalanine and tyrosine to growth, M. Womack and W. C. Rose (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 449–458, figs. 2*).—In this continuation of the investigation noted previously (E. S. R., 73, p. 126) the question of the dispensability or indispensability of phenylalanine was reinvestigated, using a concentrate of the unknown growth essential described in previous papers of the series as a supplement to a mixture of the known amino acids in highly purified form with and without phenylalanine and tyrosine alone or together. Under these conditions the tyrosine proved totally incapable of replacing phenylalanine in the food mixture. The negative results are thought not to be due to inadequate absorption of tyrosine from the alimentary tract, but to furnish definite proof of the indispensability of phenylalanine.

The effect of prolonged hard muscular work on sulphur and nitrogen metabolism, H. E. C. Wilson (*Jour. Physiol., 82 (1934), No. 2, pp. 184–188*).—A further series of observations on the effect on protein metabolism of prolonged muscular work (in this case riding a bicycle ergometer for a continuous period of over 8 hr.) is reported, with results which in general confirm previous findings (E. S. R., 68, p. 563) that during or following the work there is an increase in nitrogen and sulfur in the urine and that the increase in nitrogen bears no relation to the amount of work performed, but tends to be greater the higher the protein intake.

In the author's opinion the most reasonable hypothesis concerning the source of excess output of nitrogen and sulfur is that there is an increase in the katabolism of circulating protein.

The efficiency and performance of a vegetarian racing cyclist under different dietary conditions, G. M. Wishart (*Jour. Physiol., 82 (1934), No. 2, pp. 189–199, figs. 5*).—"The results are recorded of ergometer experiments carried out on a first class long distance racing cyclist who subsisted on rigidly controlled vegetarian diets of different protein content. The best performance

was obtained on high protein diets, although the gross efficiency was then slightly lower than on diets poorer in protein." In explanation of the better performance on diets whose gross efficiency is lower than on diets comparatively poor in protein, it is suggested that the small bulk and palatable form of protein-rich animal foods is an important factor.

Voluntarily induced increases in the rates of certain "involuntary" physiological processes of a human subject, T. M. CARPENTER, R. G. HOSKINS, and F. A. HITCHCOCK (*Amer. Jour. Physiol., 110 (1934), No. 2, pp. 320–328*).—One of the authors of this paper was able voluntarily to produce an increase without visible effort in his total respiratory exchange, pulse and respiratory rate, and systolic and diastolic blood pressure in the usual 5 and 10 min. basal metabolism tests. The increases produced amounted to from 13 to 32 percent in the oxygen absorption, 17 to 26 percent in the pulse rate, 9 to 28 percent in the systolic pressure, and 4 to 27 percent in the diastolic pressure.

"The observations demonstrate that it is possible for a person to maintain himself in a condition that is not basal, but which under the ordinary rules of measurement would be considered conforming to the usual conditions of basal metabolism measurements. The metabolic rate measured under the usual prescribed basal conditions is, therefore, not necessarily the basal rate."

Basal metabolism in old age, J. R. MATSON and F. A. HITCHCOCK (*Amer. Jour. Physiol., 110 (1934), No. 2, pp. 329–341*).—A series of basal metabolism tests is reported for 8 women from 77 to 106 yr. and 14 men from 74 to 92 yr. of age.

The 106-year-old woman, who was 147 cm tall and weighed 31.8 kg, had a heat production of 23.81 calories per hour, 0.749 calorie per kilogram body weight per hour, and 21.07 calories per square meter of body surface. Excluding the data for this very old subject and another who showed symptoms of thyroid disfunction, the average values for the other 6 women studied, whose average age was 82.5 yr., were total heat production 43.65 calories per hour, 0.74 calorie per hour per kilogram body weight, and 27.43 calories per hour per square meter of body surface. The average values for the 14 men, whose average age was 81.6 yr., were total calories per hour 50.38, calories per hour per kilogram body weight 0.82, and calories per hour per square meter of body surface 30.11.

The average values for the women subjects were well below the Harris-Benedict, Aub-DuBois, and Dreyer standards as interpolated from the data for younger age groups. The closest agreement was with the Harris-Benedict standards. The average values for the men gave fairly satisfactory agreement with the Harris-Benedict standards, but were lower than the other standards. The differences were not as great, however, as for the women.

The difference between the sexes was of approximately the same magnitude as for somewhat younger adults. The values for the men were 15.4 percent higher in total calories, 10.8 percent in terms of body weight, and 9.8 percent in terms of surface area.

Diet and relief (*Jour. Amer. Med. Assoc., 104 (1935), No. 4, pp. 320, 321*).—In this editorial attention is called to the fact that relief organizations in preparing food rations have found it necessary to work out food lists that will appeal to various racial and national groups. As an illustration the experience of the Illinois commission is cited in the development of four standard dietaries listed as general, southern, Italian, and Jewish. It is pointed out that similar considerations of racial dietary habits are also of the greatest importance for physicians who are concerned with the provision of suitable food for the sick.

Possible sources of calcium and phosphorus in the Chinese diet.—I, The determination of calcium and phosphorus in a typical Chinese dish con-

taining meat and bone, P. W. Hoh, J. C. Williams, and C. S. Pease (*Jour. Nutr., 7 (1934), No. 5, pp. 535–546*).—A typical Chinese dish known as "sweet-sour spareribs", prepared by cooking small sections of pork spareribs in a rice-vinegar, soybean sauce, salt, and sugar solution for an hour at low temperature, was analyzed for calcium and phosphorus. A serving of the meat and bone weighing 173.8 g contained before cooking 0.551 g of calcium and 0.384 g of phosphorus. After cooking, 0.45 g of the calcium and 0.27 g of the phosphorus were obtained from the meat and 0.1 g of calcium and 0.114 g of phosphorus from the solution. It is pointed out that the calcium found in the cooked material exceeds the minimum requirement of 0.45 g and approaches the allowance of 0.68 g per man per day, but that the phosphorus obtained is barely half of the minimum requirement. If the calcium and phosphorus in the material is assimilated as satisfactorily as that in well-recognized sources, such as milk and cheese, "this special way of cooking meat and bone is one which should be favored and used plentifully in the diet, especially when milk is not provided in adequate amounts."

Utilization of calcium salts by children, G. Stearns and P. C. Jeans (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 428–430*).—In this preliminary report data are given on the average daily retentions of calcium, phosphorus, and nitrogen by children in age groups of 1–4, 4–7, and 7–12 yr. on diets in which the chief source of calcium was 1 qt. of milk, 1 pt. of milk with a calcium salt furnishing the same quantity of calcium as 1 pt. of milk, and in a few instances the calcium salt as the sole source of calcium. The salts used included calcium lactate, carbonate, and gluconate, and the di- and triphosphates, the latter as the salt or as purified bone meal.

In general the calcium and phosphorus retentions when the calcium phosphates were fed were approximately equal to those from equivalent quantities of milk. After periods of low calcium intake, the calcium retentions on these salts were very high, indicating that all of the salts used were well absorbed by the average child of these ages. The retentions with the other salts were not as high. This appeared to be due to the differences in proportions of calcium and phosphorus ingested. When the intake levels of both were approximately the same, the retentions of both were good in relation to intake, but the greater the difference between the intake levels the less satisfactory were the relative retentions. It is suggested that when calcium salts are administered to children care should be taken to keep the calcium and phosphorus intakes approximately equal. "For this reason the calcium phosphates seem more dependable as sources of calcium for the growing child than the other calcium salts studied."

Dietetic deficiencies and susceptibility to infection, with special reference to children, H. M. M. Mackay (*Lancet [London], 1934, II, No. 26, pp. 1462–1466*).—This is a review and discussion of the literature on the part played by quantitative and qualitative dietary deficiencies in relation to susceptibility to infection. Deficiencies in vitamins A, B, C, and D and in iron are given special attention.

In the author's opinion a deficiency of any one of a number of different constituents of the diet will increase susceptibility to infections which may vary widely with the particular deficiency. "Thus a deficiency of iron causes a baby to be more susceptible to all common types of infection, including respiratory infections and gastro-intestinal infections; a deficiency of vitamin D is probably particularly associated with infections of the respiratory tract; a deficiency of vitamin A leads to epithelial changes which facilitate the entrance of micro-organisms, so that skin infections are an early feature."

A list of 24 references to the literature is appended.

A study of the causes of nutritional deficiency diseases in the livestock and inhabitants of Maine, with possible corrective methods secured from the utilization of Maine fishery products and the production of superior foods, W. F. DOVE (*Maine Sta. Bul. 375 (1934), pp. 191–284, pls. 2, figs. 7*).—In this report the author has attempted by a review of the literature on deficiency diseases and an application from the records for the State of Maine of climatic conditions, occurrence of defects among drafted men for the World War, and the mineral content of river and other water supplies to indicate what seem to be the principal nutritional deficiencies in the people of the State. A summary of this evidence has led to the conclusion that "there appears one deficiency in common with all phases analyzed, that is, the lack or the nonutilization of calcium. The low antirachitic value of the sunlight interfering, as it does, with the assimilation of calcium and phosphorus, combined with the suggestions secured from water analyses and feeding methods that crops may be low in the mineral calcium—with a potential phosphorus deficiency where phosphorus is dependent upon magnesium—and the draft records showing a high incidence of defects, the prevention of which has required, among other things, ultraviolet rays, calcium, and phosphorus—all of these facts point toward the same conclusion."

Experimental work (noted on page 220) on the value of Maine fishery products as a corrective for this deficiency is then reported in detail, and a final section is devoted to a discussion of the relation between fishery products, animal feeding, and the nutritional health of the inhabitants of the State. Attention is given in this section to the effect of isolation upon food habits and to the production of superior foods to prevent deficiency diseases in human beings through increasing the value of farm food products in vitamins and minerals.

An extensive list of literature references is appended.

Observations on the fatty constituents of marine plankton, I–III (*Jour. Expt. Biol., 11 (1934), No. 2, pp. 173–209, figs. 3*).—This reinvestigation of the question of the source of vitamins A and D in fish oils is reported in three papers as follows:

I. *Biology of the plankton*, E. R. Gunther (pp. 173–197).—This paper deals with the collection near the Isle of Man of samples of phyto- and zooplankton and their examination for vitamins A and D and chemical and biological characteristics.

The earlier conclusions of Ahmad (E. S. R., 64, p. 587) that phytoplankton may be a source of carotene and of Belloc, Fabre, and Simonnet (E. S. R., 64, p. 295) that zooplankton may be a source of vitamin D were confirmed, although lower values were found than previously reported. Vitamin A was proved to be absent from zooplankton, but the absence of vitamin D or its precursor in phytoplankton was considered not to be established definitely.

II. *General character of the plankton oils*, G. Collin, J. C. Drummond, T. P. Hilditch, and E. R. Gunther (pp. 198–202).—The oils from the phyto- and zooplankton were isolated, with precautions to prevent destruction of vitamins A and D, and their general chemical characteristics determined. The paper also reports a chemical study of the unsaponifiable fraction of zooplankton oil.

III. *The vitamin A and D content of oils derived from plankton*, J. C. Drummond and E. R. Gunther (pp. 203–209).—The oils separated from phyto- and zooplankton, as noted above, were tested for vitamins A and D biologically, the vitamin D tests including both the line test and X-ray examination for degree of healing. The feeding tests for vitamin A were supplemented by the antimony trichloride color test and spectroscopic examination.

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The phytoplankton oil was more potent than the zooplankton oil as a source of vitamin A activity, which was shown to be due entirely to carotene. In the vitamin D tests daily doses of 50 mg of the phytoplankton oil showed no antirachitic activity and of zooplankton slight activity. It is suggested that the small amount of vitamin D which appears to be present in zooplankton results from irradiation while in surface waters rather than from a prolonged diet of phytoplankton.

Physiology of the sterols, including vitamin D, C. E. Bills (*Physiol. Rev., 15 (1935), No. 1, pp. 1–97*).—This comprehensive review of the literature on the subject is presented under the following general headings: Distribution of sterols in the animal and vegetable kingdoms; general chemical considerations; origin, absorption, and excretion of sterols; function of the sterols; action of light on sterols—formation of vitamin D; and the physiology of vitamin D.

Tables are included on the ratio of ergosterol to total sterols in various animal and higher plant sources, as reported in the literature; the quantity of vitamin D expressed in international units per gram in various fish oils, as determined in the author's laboratory, the list being a revision and extension of an earlier table (E. S. R., 57, p. 294); and the vitamin D content of average cod-liver oil in terms of various systems of units now in use.

[Vitamin studies at the South Dakota Station], E. Pierson (*South Dakota Sta. Rpt. 1934, pp. 34, 35*).—This progress report gives preliminary data on the vitamin B_1 content of the meat, liver, tongue, brains, kidney, heart, pancreas, and thymus of South Dakota tailless lambs from 8 to 11 mo. of age, reared on known diets, and the vitamin C content of canned spinach as determined by the Sherman-LaMer-Campbell and Höjer methods.

[Vitamin studies at the Tennessee Station], F. L. MacLeod (*Tennessee Sta. Rpt. 1933, pp. 43, 44*).—This progress report gives data on the vitamin A content of sweetpotatoes of the Porto Rico and Yellow Jersey varieties directly after harvesting and after storage for 2 mo. or more, preliminary data on the vitamin A content of sweetpotatoes of the Triumph and Southern Queen varieties, and of the vitamin G content of leaf lettuce.

The fate of carotene injected into the circulation of the rat, J. C. Drummond and R. J. MacWalter (*Jour. Physiol., 83 (1934), No. 2, pp. 236–242*).—During an investigation which had as its main objective the determination of the amount of vitamin A formed in the liver from various isomers of carotene, it was found that carotene injected into the portal circulation of rats in the form of aqueous colloidal solutions was uniformly taken up by the liver lobes and tended to disappear from the liver during the next few days. Its disappearance was not correlated with the formation of vitamin A, for in many of the animals a reduction in the amount of this vitamin also occurred after the injection and operation of removing part of the liver for examination. Further investigation showed that the removal of one lobe of the liver may of itself bring about a substantial decrease in the amount of vitamin A stored in the residual lobes.

The storage of vitamin A in the liver of the rat, A. B. McCoord and E. M. Luce-Clausen (*Jour. Nutr., 7 (1934), No. 5, pp. 557–572, fig. 1*).—A hitherto unpublished modification by S. W. Clausen of the Carr-Price antimony trichloride method of determining vitamin A, the essential features of which are summarized in a footnote, was used in this study of the distribution of vitamin A in the blood and tissues of young and adult rats on the Sherman diet B, with and without additional vitamin A. The data obtained are expressed in arbitrary units, each of which is equivalent approximately to 0.01 Sherman unit.

The vitamin A content of the blood of animals on diet B, with no additions, averaged about the same at 54 and 264 days, 14.5 and 14 units per cubic centimeter, respectively. At 54 days no vitamin A was found in the body fat, and

at 264 days the average value was 37 units per 100 g. The liver values were 303 and 2,820 units, respectively.

Young rats killed 24 hr. after having been fed 1 drop of halibut liver oil per rat were found to have a slight increase in the vitamin A content of the blood, a marked increase in that of the liver, and a considerable amount in the body fat. Adult rats, varying in age from 186 to 204 days, fed 1 drop of halibut liver oil per week for varying lengths of time showed increased storage of vitamin A in the liver with increased dosage. The young of a female rat which had received 1 drop of halibut liver oil the day before the young were born and 1 drop per week during the 3 weeks of lactation had a considerably higher content of vitamin A in the liver at 54 days than rats of the same age whose mothers had had no supplement. Adult female rats receiving 4 drops of halibut liver oil 24 hr. before death had considerably more vitamin A in various tissues than the controls which had received no supplement, the recovery of added vitamin A amounting to about 77 percent.

Additional vitamin A appeared to be without effect in preventing or curing a mild infection of the ear in adult rats.

Physiological and therapeutic action of colloidal solutions of provitamin A applied locally to the eye [trans. title], PH. A. RATSCHEWSKIJ (*Klin. Wchnschr., 13 (1934), No. 25, p. 918*).—The observations reported by Balachovski and Ratchevski (E. S. R., 72, p. 418) have been extended to a total of about 200 cases, including some in which one eye was treated with a colloidal carotene solution as described in the previous paper and the other eye with a 2–4 percent alcohol solution without carotene or with various preparations used in ophthalmological practice.

The solution of carotene or its oxidation product gave better results than any of the other preparations tested with various pathological conditions of the eye. It is emphasized, however, that the carotene had no bactericidal effect, but simply hastened the regeneration of the damaged epithelium.

Xerophthalmia, trigeminal degeneration, and vitamin A deficiency, E. MELLANBY (*Jour. Path. and Bact., 38 (1934), No. 3, pp. 391–407, pls. 6*).—The object of the investigation, of which this paper reports the part dealing with the eye, its related sensory nerve, and ganglion cells, was to see if there is any association between the two principal pathological conditions produced in animals by diets deficient in vitamin A and carotene, namely, the epithelial and mucous membrane changes and degenerative changes in the nervous system. Studies with rabbits are reported in detail, with sufficient evidence from dogs and rats to show that although there are differences in reaction to vitamin A deficiency in different animals the general results are the same. The rabbits were kept from the age of 8 to 10 weeks on diets deficient in vitamin A or carotene, killed at various periods after the development of xerophthalmia, and sections of the first division of the trigeminal nerve examined macroscopically and microscopically.

The data obtained, which are illustrated by photographs and photomicrographs including a few from experiments on dogs, are considered to suggest that "xerophthalmia produced in animals by diets deficient in vitamin A and carotene may be secondary to a loss of the neurotrophic control normally exerted on the cornea by the ophthalmic division of the trigeminal nerve." The evidence upon which this conclusion is based is essentially as follows:

"When xerophthalmia is present, the corresponding trigeminal nerve usually shows degenerative changes in the myelin sheaths, and in the rabbit their development is commonly almost synchronous." In early and slight xerophthalmia, when the corneal membranes are still capable of returning to normal on adding carotene or vitamin A to the diet, the nerve also returns to normal,

while in later stages of xerophthalmia when recovery is no longer possible, the nerve fiber does not recover or it does so only after months of vitamin A or carotene therapy.

The nerve cells of the Gasserian ganglion, as well as the nerve fibers, show degenerative changes. The possibility is suggested that the original lesion may be in the cells and that the trigeminal changes, peripheral and central, are secondary. "Since degeneration of the afferent nerves is widespread in animals brought up under these experimental conditions, it is probable that hyperplasia and metaplasia of other epithelial and mucosal surfaces throughout the body, and the subsequent invasion of these tissues by micro-organisms, are also related to changes in their afferent nerve supply."

Neurological disturbances in rats reared on diets deficient in vitamin A, S. B. D. Aberle (*Jour. Nutr., 7 (1934), No. 4, pp. 445–461, pl. 1*).—In the course of an investigation of the reproductive organs in rats fed diets low in vitamin A (E. S. R., 69, p. 759), a disabling paralysis was noted in the animals suffering from chronic deficiency. This paper reports a further investigation of the paralysis with respect to other factors involved in vitamin A deficiency. Macroscopic and microscopic studies of the tissues of the central and peripheral nervous systems by Zimmerman have been noted previously (E. S. R., 69, p. 311).

The paralysis, which is described as characterized clinically by clumsiness, incoordination, and finally a spasticity, with a complete lack of control of the affected limbs, was found to be associated with degeneration of parts of the nervous system. It appeared only in animals suffering from a long-continued chronic deficiency of vitamin A. In the acute cases the animals died before the paralysis appeared. It did not appear in the animals on the synthetic vitamin A-free diet supplemented with cod-liver oil or in rats on a table scrap diet or suffering from severe inanition but provided with plenty of vitamins.

Rats which were without stored vitamin A at the beginning of the experiment had a greater incidence of paralysis, developed symptoms earlier and in a more pronounced degree, and died sooner than rats which had an ample store of vitamin A at the beginning of the experiment.

The symptoms of paralysis always occurred after the appearance of continual cornified vaginal cells and at about the same time as or somewhat later than xerophthalmia or loss in weight. Attention is called to several observations in earlier vitamin literature suggestive of the paralytic condition observed, but attributed in some instances to a toxic factor in the diet. It is suggested that before the toxicity of certain foods can be postulated it is necessary to feed animals on a diet adequate in vitamin A.

Vitamin A and nerve lesions (*Brit. Med. Jour., No. 3857 (1934), pp. 1053, 1054*).—This editorial review of the papers of Mellanby and Aberle noted above closes with the following comment:

"From the purely clinical point of view we have to consider how far these findings may secure application in the treatment or arrest of nervous disease. The necessity of certain minute quantities of specific chemical substances for the proper nutrition of nerve cells, nerve fibers, and the proper maintenance of trophic control is what has now to be appreciated by the clinician. Hormones, vitamins, chemical mediators: These are the terms in which the future clinician will discuss the problems of neurology."

The vitamin B_1 and B_2 G content of liver extract and brewers' yeast concentrate, D. K. Miller and C. P. Rhoads (*Jour. Expt. Med., 59 (1934), No. 3, pp. 315–331, figs. 4*).—Liver extract powder No. 343 (Lilly) and the same material prepared for parenteral use in the treatment of pernicious anemia were tested for their content of vitamins B_1 and B_2 by the usual feeding methods with

rats. In the B_1 tests autoclaved bakers' yeast was used as a source of vitamin B_1, and in the B_2 tests the international standard preparation of activated Java clay as vitamin B_1.

The liver extract powder in doses corresponding to 2.5 g of fresh whole liver was found to contain sufficient vitamin B_1 to support growth in the animals receiving an adequate quantity of vitamin B_2 with no other source of B_1, but not in those receiving an adequate quantity of vitamin B_1 without additional B_2. Comparable results were obtained when the material was administered by intraperitoneal injection, although the material was not as effective in the vitamin B_1 tests as when administered by mouth.

A brewery yeast concentrate, vegex, which had been shown by Strauss and Castle (E. S. R., 68, p. 280) to be effective after incubation with human gastric juice in the treatment of pernicious anemia and thus to contain the extrinsic factor, was tested for vitamins B_1 and B_2 in quantities of 50, 150, and 250 mg daily with similar results, the material proving to be richer in vitamin B_1 than B_2.

"These experiments indicate that the extrinsic, antianemic factor of Castle and the thermostable growth-promoting food constituent, commonly known as vitamin B_2 G, are not identical."

Non-identity of vitamin B_2 and flavines, C. A. ELVEHJEM and C. J. KOEHN, JR. (*Nature [London], 134 (1934), No. 3400, pp. 1007, 1008*).—Observations are reported briefly leading to the conclusion that vitamin B_2 and the flavines are not identical. It was found that flavine or lumiflavine prepared by adsorption on fuller's earth from a liver extract did not protect chicks from pellagra, but seemed to induce more severe symptoms than the basal ration alone. The fraction remaining after the removal of the flavine was highly active and retained its activity after purification to a colorless concentrate. Another fraction remaining after the liver extract had been irradiated and the lumiflavine extracted with chloroform was also active. It is noted that no decisive evidence could be found in the literature to refute the conclusion that vitamin B_2 and flavines are two separate and distinct chemical entities.

The effect of adenine to albino rats on a diet deficient in vitamin B_4, C. Y. CHEN (*Natl. Univ. Peiping, Col. Agr., Dept. Agr. Chem., Nutr. Bul., Pub. Ser. B, Bul. 1 (1934), pp. 40–46, figs. 4*).—Adenine was found to have no vitamin B_4 potency when tested on rats, using the method of Reader (E. S. R., 65, p. 594).

On the non-identity of adenine and vitamin B_4, C. Y. CHEN (*Bul. Agr. Chem. Soc. Japan, 10 (1934), No. 7–9, pp. 105–108, figs. 4*).—Essentially noted above.

Vitamin B and pernicious anaemia (*Lancet [London], 1934, II, No. 24, p. 1351*).—An editorial summary of the literature dealing with the still unsettled question of the identity or nonidentity of vitamin B_2 with the extrinsic factor for pernicious anemia.

Deficiency of vitamin-B_2 (G) as an etiologic factor in leprosy, N. K. BASU (*Ztschr. Vitaminforsch., 3 (1934), No. 3, pp. 194, 195; Ger., Fr. abs., p. 195*).—Treatment of early cases of leprosy (India) with a vitamin B (complex) concentrate similar to marmite was followed after about a month by a return of sensation in the so-called anesthetic patches of the skin. This response to treatment, together with the observations that the previous diet of the leprosy patients had been low in protein and the vitamin B complex, particularly vitamin G, is thought to suggest the possibility that a deficiency of vitamin G is of some significance in the etiology of leprosy and that a deficiency of protein plays an accessory part.

***Ascorbic acid and blood catalase* [trans. title],** G. TÖRÖK and L. NEUFELD (*Klin. Wchnschr., 13 (1934), No. 34, pp. 1205–1207*).—Two premature, 3 dystrophic, and 2 healthy infants were given from 10 to 30 mg of ascorbic acid daily for 2 weeks, and determinations were made of the catalase content of

the blood at the beginning of the experiment and on the fifth, tenth, and fifteenth day. No significant changes were observed as a result of the ascorbic acid treatment.

Similar tests conducted on a guinea pig and 3 rabbits on a vitamin C-deficient diet supplemented after a preliminary period with 10 mg of ascorbic acid daily showed a fall in the blood catalase after from 7 to 10 days on the deficient diet, followed by a marked rise during the ascorbic acid treatment. The intravenous injection of 50 mg of ascorbic acid was followed almost immediately by a rise in catalase. The authors conclude that the mechanism of catalase action is influenced by ascorbic acid.

Determination of vitamin C in blood serum [trans. title], E. GABBE (*Klin. Wchnschr., 13 (1934), No. 39, pp. 1389–1392*).—A modification of the Tillmans test is described, with data on the vitamin C content of blood serum in a number of pathological conditions and in individual cases before and after treatment for 7 days with a vitamin C-poor diet, a vitamin C-rich diet, and daily medication with 90 mg of ascorbic acid in the form of Cebion tablets (Merck).

The modified method consists essentially in treating 25 cc of pure nonhemolytic serum or plasma with 25 cc of 20 percent trichloroacetic acid, neutralizing 25 cc of the filtrate with 10 percent sodium hydroxide with litmus as indicator, acidifying with 2.5 cc of a 2.5 percent solution of primary sodium phosphate, digesting the solution for 6 hr. with hydrogen sulfide, neutralizing the filtrate with sodium hydroxide, and making the solution barely acid with a few drops of 3 percent acetic acid. The final solution is titrated rapidly with N/1,000 2,6-dichlorophenolindophenol to the first appearance of a blue color.

Among the 90 patients examined, the vitamin C content ranged from 0.14 to 1.21 mg per 100 cc of serum. In 25 cases the values were between 0.5 and 0.69 mg per 100 cc. The lowest values occurred in the most severe infections and the highest in convalescence, although there was no evidence that lack of vitamin C promoted the onset of infection.

In most instances the vitamin C content of the serum could be correlated with the diet. In the experiments in which the subjects were kept on a low vitamin C diet, the vitamin C content of the blood serum was low at the end of the week, and the opposite was true for those receiving a diet with high vitamin C content. A patient with cystopyelitis and one with chronic nephritis showed marked increases in the vitamin C content of the serum after medication for 10 days with 90 mg of ascorbic acid (9 tablets of Cebion daily). In some instances the Göthlin capillary resistance test was also applied. When the blood serum values were very low, below 0.4 mg per 100 cc, the number of petechiae were significantly higher than normal, but consistent values were not always obtained.

Vitamin C and plasma protein bodies [trans. title], A. BÖGER and H. SCHRÖDER (*Klin. Wchnschr., 13 (1934), No. 23, pp. 842, 843*).—Data are presented showing a rise in serum protein, particularly the albumin fraction, and a decrease in coagulation time of the blood following the intravenous injection of ascorbic acid in a selected group of patients suffering from pseudohemophilia, simple jaundice, and other conditions involving hematuria. The apparent styptic action of vitamin C is thought to be due to its effect in raising the albumin fraction of the plasma protein.

The vitamin C content of the brain and cerebrospinal fluid in relation to age [trans. title], F. PLAUT and M. BÜLOW (*Klin. Wchnschr., 13 (1934), No. 49, pp. 1744, 1745*).—From determinations by the Tillmans method of the ascorbic acid content of the brains of new-born and year-old mice and rabbits and of human brains on autopsy from fetuses of different ages, infants, and old people,

the authors conclude that the vitamin C content of the brain diminishes from before birth to old age. In the autopsy material, the brain of a 5-weeks fetus had a content of 0.31, and of a 90-year-old man of 0.05 mg per gram of brain tissue.

Samples of cerebrospinal fluid were found to have about one-tenth the amount of ascorbic acid present in the corresponding brain. It is suggested that this relationship may hold for other active organs and the corresponding fluids. The relationship of ascorbic acid to cellular oxidation reduction processes is discussed.

The role of fat-soluble vitamins in the synthesis of vitamin C by the animal organism [trans. title], P. ROHMER, N. BEZSSONOFF, and E. STOERR (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 1, pp. 56, 57*).—Continuing the studies noted previously (E. S. R., 72, p. 422), the authors found that in infants of from 1 to 8 mo. of age fed a preparation of dried acid milk the elimination of vitamin C in the urine disappeared after 4 or 5 days. On supplementing the milk with vitamins A and D in the form of egg yolk or an extract of cod-liver oil, vitamin C reappeared in the urine after several days. This is thought to indicate that vitamin A or D, probably vitamin A, is essential for the synthesis of vitamin C.

The influence of factors other than food on the synthesis of vitamin C by the animal organism [trans. title], P. ROHMER, N. BEZSSONOFF, and E. STOERR (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 1, pp. 58, 59, fig. 1*).—Samples of cow's milk from three different sources, including pasteurized milk from a dairy and milk from two farms, were tested for vitamin C by the Bezssonoff color test weekly for about a year. The vitamin C content of all three milks remained low during the winter and rose abruptly in March well in advance of pasturage and with no essential change in the feed of the cows. This abrupt increase in the vitamin C content of the milk is attributed to a sudden increase in the ability of the cows to synthesize vitamin C. Additional sunlight and more favorable temperatures are considered possible factors favoring the synthesis of vitamin C, and it is suggested that infants may likewise be affected in their power of synthesizing vitamin C.

The effect of fluorine feeding on the storage of vitamin C in the rat and guinea pig, H. M. HAUCK (*Jour. Agr. Res. [U. S.], 49 (1934), No. 11, pp. 1041–1046, fig. 1*).—This investigation at the New York State College of Home Economics was suggested by various studies, at the Wisconsin Experiment Station and elsewhere, pointing to the possibility that fluorine poisoning interferes in some way with the action of vitamin C on the organism. Rats and guinea pigs were selected as experimental animals because the livers of the former contain vitamin C even on a scorbutic diet and of the latter only on an antiscorbutic diet.

Rats from 3 to 5 mo. of age were fed for from 10 to 13 weeks a stock ration to which 0.15 percent sodium fluoride had been added. Young guinea pigs weighing from 200 to 300 g were fed approximately 25 mg of fluorine (as a 4 percent solution of sodium fluoride) per kilogram body weight plus 3 cc of orange juice daily in addition to a basal scorbutic diet for a period of from 22 to 34 days. At the end of the experimental periods for both rats and guinea pigs the livers and adrenals of the experimental and control animals were tested for vitamin C on guinea pigs. The livers were fed in amounts of 1 and 3 g and the adrenals in amounts of slightly more than 1 g daily. The feeding was continued for 26 days in the case of the material from rats and for only 9 days for the guinea pig material. The guinea pigs used for testing were examined for gross scurvy symptoms, and on autopsy the silver nitrate staining test was applied to the cut adrenals.

No difference was observed between the vitamin C content of the livers and adrenals of fluorine-fed and control rats as determined by feeding tests or in the adrenals as determined by the silver nitrate staining test, nor did the fluorine prevent storage of vitamin C in the adrenals and livers of guinea pigs.

The author concludes that "if fluorine feeding results in an interference with the action of vitamin C in the organism, such interference probably occurs elsewhere in metabolism rather than in storage of the vitamin."

Treatment of adult scurvy with crystalline vitamin C (ascorbic acid), I. S. Wright (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, p. 475*).—In this preliminary report it is announced that three adult patients suffering from severe scurvy showed rapid improvement within 6 days and a complete cure within 4 to 5 weeks following oral treatment with crystalline ascorbic acid in doses of 0.06–0.09 g per day in connection with a diet deficient in vitamin C. Other patients have been treated with ascorbic acid by intravenous injection in doses up to 0.1 g per day dissolved in 5 cc of sterile normal saline solution with no untoward effects. The criteria used in determining improvement were improvement in general condition, disappearance of purpuric spots and cessation of the appearance of new purpuric spots, cessation of bleeding from nose, gums, and intestines, and marked decrease in capillary fragility to within normal limits.

The capillary fragility test used was a modification of the tourniquet test, the technic of which is described.

The influence of vitamin D in the prevention of dental caries, P. G. Anderson, C. H. M. Williams, H. Halderson, C. Summerfeldt, and R. G. Agnew (*Jour. Amer. Dental Assoc., 21 (1934), No. 8, pp. 1349–1366, figs. 9*).—In this carefully controlled investigation, children from 2 to 16 yr. of age in two orphanages where the diets were excellent served as subjects. The children in each orphanage were divided into two groups, one of which continued on the regular institutional diet and the other on the same diet supplemented with 8 drops of 250D viosterol daily. This was incorporated in plain ginger cookies, the control group receiving similar cookies without the viosterol. There were 75 children in the control and 87 in the vitamin D group who were observed over a period of 1 yr. Dental examinations, including roentgenographic, orthodontic, periodontic, and hard tissue, were made at the beginning and end of the year.

Although the children not receiving vitamin D averaged only one-half as many cavities per year as reported for Toronto school children, the administration of vitamin D decreased dental caries to a marked extent as shown by statistical analysis of the data, the results of which are summarized as follows:

"The number of cavities originally present is not an index of susceptibility to new cavity formation. The effect of vitamin D in reducing the number of new cavities per child and in reducing the number of children who develop new cavities has been shown to be striking in the children from 3 to 10 yr. of age, but not statistically significant in those from 11 to 16 yr. Vitamin D is equally effective in reducing the new cavity formation in deciduous and in permanent teeth. The apparent reduction in the number of markedly progressive cavities by vitamin D is not statistically sound. The favorable effects of vitamin D were as apparent within the family group as in children not within family groups. The two sexes reacted similarly to vitamin D, except that there is evidence that the older boys respond better to the vitamin than the older girls."

Relation between the physical character of food and dental caries in albino rats, C. A. Lilly and L. Wiley (*Jour. Nutr., 7 (1934), No. 4, pp. 463–472,*

figs. 2).—In continuation of attempts to determine the cause of dental caries (E. S. R., 67, p. 480; 69, p. 475), the suggestion of Hoppert, Webber, and Canniff (E. S. R., 68, p. 711) that the physical form and size of the food may be an important factor was tested with rats, with results which are summarized as follows:

"Diets adequate for growth, weight, and reproduction according to accepted standards, containing coarse corn meal, produced dental caries in 66 percent of albino rats in 100 days and in 100 percent of the rats in 125 days. The incidence of caries was related to the physical form of the food (corn meal) and not to the calcium or phosphorus values of the diet. If the coarse corn meal were made soft by cooking or ground fine enough to pass a 60-mesh sieve, no caries was produced. Vitamin D did not prevent the occurrence of the caries."

The practical treatment of rickets in children, J. R. W. Hay (*Lancet [London], 1934, I, No. 26, pp. 1390–1392*).—A clinical comparison is reported of the efficacy of cod-liver oil, ultraviolet irradiation, and three proprietary vitamin D products, administered in supposedly comparable doses to groups of from 5 to 7 children from about 2 to 4 yr. of age suffering from rickets in varying degrees of severity. The experiment was conducted during the winter months, and the children were kept in bed in a special ward on a uniform diet and with all natural ultraviolet radiations excluded. Each child was radiographed on admission and at brief intervals during the treatment.

In most of the children receiving irradiation, cure was effected within 4 weeks and in all within 8 weeks. Cod-liver oil induced satisfactory healing within 6 weeks in most instances, but the results were not quite as clear as were those obtained by ultraviolet irradiation. The vitamin D products were very ineffective. One of them was subsequently tested on rats by H. D. Griffith, with the report that "the sample of ergosterol used was either incompletely activated or it had lost its activity subsequent to preparation."

It is noted that even if the vitamin D products had proved efficacious the cost of the treatment would have been twice as much as for cod-liver oil for two of the products and five times as much for the third.

The author concludes that, when once developed, rickets requires more than an adequate diet to bring about a rapid cure; that ultraviolet therapy, especially with the carbon arc lamp, is particularly suitable for clinics and institutions; and that a reputable brand of cod-liver oil is probably the cheapest effective substance for home use. "Regarding the many expensive preparations of the 'potted alphabet' type, which doubtless today contain their quota of antirachitic units, it is suggested that a preliminary trial in children such as has been described should be made before employing them on a larger scale."

Anemia of prematurity, H. W. Josephs (*Amer. Jour. Diseases Children, 48 (1934), No. 6, pp. 1237–1257, figs. 19*).—This report covers a part of the investigation on the mechanism of anemia in infancy, other phases of which have been noted previously (E. S. R., 67, p. 485). A group of premature infants was studied during the first 3 or 4 mo. under varying types of therapy and with frequent determinations of hemoglobin and reticulocytes.

Iron, given as ferric ammonium citrate in a 10 percent solution, 2 cc per kilogram body weight, had no demonstrable effect on the hemoglobin until about the fortieth day, after which there was an increase, more pronounced the lower the initial value. This was also true of reticulocytes. The color index tended to be high during the first few weeks and then to fall gradually. Liver, either as an emulsion or an extract, had no effect when given in the early periods alone or as a supplement to iron, but in a few instances in which it was given later there was an immediate effect. Copper was without effect.

The anemia of premature infants (*Jour. Amer. Med. Assoc., 104 (1935), No. 7, p. 565*).—An editorial review of recent literature on the subject, including the paper by Josephs noted above.

An analysis of the anemia of pregnancy in the rat, E. C. Van Donk, H. Feldman, and H. Steenbock (*Amer. Jour. Physiol., 107 (1934), No. 3, pp. 616–627, figs. 4*).—An investigation of the anemia of pregnancy in rats is reported, with the conclusion that this type of anemia is not of dietary origin, since it was found impossible to correct it by the addition of copper, iron, manganese, iodine, arsenic, yeast, dried beef liver, fresh egg yolk, and cod-liver oil to a ration satisfactory for reproduction.

The amount of water in the blood increased about 4 percent during the later stages of pregnancy at a time when the anemia was becoming more severe. The water content of the carcasses of pregnant rats calculated on a fat-free basis was higher than of nonpregnant rats. The difference is thought to be accounted for by differences in the water content of the skin and muscle tissue.

"It is suggested that in an analysis of an anemic condition in the human during pregnancy it might be advisable to give consideration to the picture being complicated by an hydremia."

The place of iron in hookworm anaemia (*Lancet [London], 1934, II, No. 25, pp. 1400, 1401*).—In this editorial review of recent literature on the results of iron administration in hookworm anemia, an analogy is drawn between the hypochromic anemias of hookworm infection and of pregnancy in that the hookworm in the first instance and the fetus in the second are in a sense parasites on the iron reserves of the host. In both instances the anemia may be relieved by iron treatment but is not cured as long as the parasite remains.

The value of some common vegetables in curing nutritional anemia in the rat, F. Hanning (*Jour. Amer. Dietet. Assoc., 9 (1934), No. 6, pp. 486–489*).—Rapid curing of nutritional anemia in rats and marked acceleration in growth resulted from the addition of dried, canned strained vegetables (tomatoes, green beans, peas, spinach, and vegetable soup) to the milk and cod-liver oil diet on which anemia had been produced. The vegetables were fed at levels furnishing 0.4 and 0.1 mg of iron daily. Dried prunes and liver were also fed at the lower level.

Except for the green beans and the liver, the hemoglobin response at either level of iron was of the same general order as the copper content. In liver the limiting factor is thought to be iron, since part of the iron is in the form of hematin. "Assuming the analogy of true nutritional anemia in the human and in the rat, these tests suggest the beneficial effects of vegetable feeding as sources of iron and copper in infant diets."

Absence of dietary anti-anemia substance in the diet causative of canine black tongue, D. K. Miller and C. P. Rhoads (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 419–421*).—To test the theory that in canine blacktongue and pernicious anemia the same dietary constituent is lacking, adult guinea pigs were fed the Goldberger blacktongue-producing diet supplemented with 2 cc of fresh orange juice daily, with and without the addition of various materials capable of producing remissions in pernicious anemia.

The controls not receiving the anemia-preventive material lost weight rapidly and died before the end of the third week. When 0.6 g of liver extract No. 343 was administered all of the animals survived and gained weight. The commercial yeast extract Vegex was ineffective in 1-g daily doses, but protective at a level of 2 g. Desiccated hog stomach (Ventriculin) was ineffective in 2-g daily doses, but 1 g of Ventriculin and 1 g of Vegex proved completely prophylactic.

These results are thought to indicate that the deficiency causing canine blacktongue is closely allied to that of pernicious anemia. "Moreover, the death

or survival of the guinea pig fed the diet producing blacktongue may serve as a useful test for evaluating the potency of various substances used in the treatment of pernicious anemia in the human being."

Studies on the nervous system in deficiency diseases: Experimental black tongue, H. M. ZIMMERMAN, G. R. COWGILL, W. W. BUNNELL, and M. DANN (*Amer. Jour. Physiol., 109 (1934), No. 3, pp. 440–446, figs. 2*).—A comparison of the symptoms and gross and microscopic lesions in dogs on the blacktongue-producing diet of Goldberger et al. with those reported by Zimmerman and Burack for dogs on diets deficient in vitamin G (E. S. R., 71, p. 426) is reported, with the conclusion that the degenerative changes in the spinal cord in the two conditions differ in degree but not in kind. Studies of the gastric secretions and blood gave no evidence that the deficiency involved has any relation to the syndrome of combined system disease.

Jerusalem artichoke in the treatment of diabetes, L. K. CAMPBELL (*Arch. Int. Med., 54 (1934), No. 1, pp. 82–87*).—Experiments with a phlorhizinized dog and two diabetic subjects are reported, leading to the conclusion that "there is no striking difference in the utilization of Jerusalem-artichoke in diabetes from that of an equivalent amount of oatmeal."

The clinical significance of traces of fluorides in water, N. J. AINSWORTH (*Analyst, 59 (1934), No. 699, pp. 380–385, fig. 1*).—A review of the literature on the subject is followed by a brief report on the occurrence of mottled enamel in about 90 percent of the children in Malden, Essex, England. An examination of the water supply of the affected areas showed a fluorine content of between 4.5 and 5.5 p. p. m. A discussion of the paper is reported in abstract.

Skin lesions of pellagra, T. D. SPIES (*Arch. Int. Med., 52 (1933), No. 6, pp. 945–947*).—Essentially noted from a preliminary report (E. S. R., 70, p. 138).

A dietary treatment for tuberculosis.—I, Results in bone and joint tuberculosis, H. STEMPA (*Amer. Rev. Tuberc., 30 (1934), No. 3, pp. 365–374*).—The dietary treatment described is said to be "simply an attempt at supplying the necessary vitamins and minerals in such quantities as will enable the patient's blood to lessen the virulence of the tubercle bacilli, and thus make it easier for his defense powers to destroy the invading germs." Lists of foods to be absolutely excluded and permitted foods are given, together with methods of preparation, quantities, and a sample menu with the daily diet routine. Clinical results are reported on the use of this dietary treatment in three cases of bone and joint tuberculosis.

The effect of moderately large dosage of viosterol on tuberculous children, H. G. PONCHER and B. M. GASUL (*Amer. Rev. Tuberc., 30 (1934), No. 3, pp. 358–364*).—Viosterol in doses of 150 drops daily for 4 mo. and 300 drops daily for the next 3 mo. had no definite effect on the course of tuberculous process in a group of 59 children with a definite positive tuberculin reaction chosen from among the patients at the Municipal Tuberculosis Sanitarium of Chicago. Hypercalcemia was not produced by either dosage of viosterol. The pulse rate, appetite, number of stools, and general clinical appearance were not materially affected, and no definite changes were noted in the roentgenological examinations.

The majority of the patients showed slight or moderate gains in weight during the period on the lower dosage of viosterol. On the higher dosage 50 percent of the patients lost weight and only 30 percent showed slight or moderate gains in weight. During a period of 8 mo. after viosterol was discontinued all of the 35 patients who remained under observation gained weight, and in the majority of cases at a higher rate than during the viosterol treatment.

In view of these findings the authors question the advisability of using moderately large doses of viosterol over a long period for children with tuberculosis,

on the ground that the secondary effects of such therapy do not appear to be favorable to the patient.

Streptococcus food poisoning, E. O. Jordan and W. Burrows (*Jour. Infect. Diseases, 55 (1934), No. 3, pp. 363–367*).—An investigation of an outbreak of food poisoning at Winona, Minn., gave evidence in regard to streptococci of the same character as that obtained for staphylococci in previously reported outbreaks of food poisoning (E. S. R., 63, p. 891) in that a green-producing streptococcus freshly isolated from a cream pie implicated in the outbreak yielded a toxic filtrate. Similar toxic filtrates were also yielded by freshly isolated green-producing streptococci from other sources and from two strains of hemolytic streptococci.

An exhibition of books illustrating the progress of gastroenterology, B. B. Crohn and B. D. Rosenak (*Bul. N. Y. Acad. Med., 2 ser., 11 (1935), No. 2, pp. 74–97*).—This is an annotated bibliography of 79 books selected as outstanding in the history of the development of the subject from the time of Hippocrates to the present. A selected list of modern classics considered essential to a proper understanding of gastroenterology and its relation to internal medicine is included under the title "Two-and-a-Half-Foot Shelf" of a gastroenterologist.

Mating and productivity of rats (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 71, 72*).—This progress report on an investigation by A. H. Smith and W. E. Anderson of reproduction of the albino rat on a presumably complete diet discusses briefly the relationship of interval between matings and reproduction performance, and a comparison of the weaning weights in successive generations.

TEXTILES AND CLOTHING

Statistical methods in textile research.—Part 2, Uses of the binomial and poisson distributions, L. H. C. Tippett (*Jour. Textile Inst., 26 (1935), No. 1, pp. T13–T50, fig. 1*).—Part 2 of this paper (E. S. R., 63, p. 696) deals with the statistical treatment of data taking the form of counts of numbers of units having a given characteristic, e. g., (1) for the proportion of immature cotton fibers in a sample and (2) number of yarn breakages during a given period, and more complicated problems involving both rate and proportions.

A. S. T. M. standards on textile materials (*Philadelphia: Amer. Soc. Testing Materials, 1933, pp. [6]+164, figs. 28*).—"This pamphlet contains the methods of testing, definitions, terms, and specifications for textile materials developed by the American Society for Testing Materials, and materials relating thereto. It is published for the purpose of presenting in a single cover data that the Society believes to be of much importance to all who deal with textile materials."

The influence of various kinds of wool on some of the physical properties of flannel, E. Pierson (*South Dakota Sta. Rpt. 1934, pp. 35–38*).—Textile tests on wool fibers from five breeds of sheep and on the yarns and fabrics made from these wools are reported on briefly.

HOME MANAGEMENT AND EQUIPMENT

The game of planning a house, D. Scoates (*Dallas, Tex.: Southwest Press, 1933, pp. VII+150, figs. 53*).—This is a popular treatise on house planning prepared primarily to assist the layman in assembling his ideas relative to the house he wishes to construct. It is based on many years' experience in research and teaching in the land-grant colleges of Texas, Mississippi, and other States. It contains chapters on size of rooms, standard sizes of rooms, ar-

rangement of rooms, size of houses, finishing the best solution, visualizing the complete plan, what about the outside, and remodeling, and a bibliography.

A study of ovens used for domestic cooking purposes (*Indiana Sta. Rpt. 1934, pp. 44, 45, fig. 1*).—This progress report (E. S. R., 71, p. 287) discusses briefly, without numerical data, relative operating costs under different conditions of five electric-range ovens.

MISCELLANEOUS

Index to publications of the United States Department of Agriculture, 1926–1930, compiled by M. A. Bradley (*U. S. Dept. Agr., 1935, pp. V+694*).—This combined subject and author index continues that previously noted (E. S. R., 68, p. 425). It covers all publications of the Department for the period 1926–30 with the exception of bureau periodicals and includes the *Journal of Agricultural Research* and the *Official Record*.

Agricultural investigations on the Newlands (Nev.) Reclamation Project, E. W. Knight (*U. S. Dept. Agr., Tech. Bul. 464 (1935), pp. 36, figs. 8*).—The experimental work reported is for the most part referred to elsewhere in this issue. Meteorological observations are also included.

Report of the director [of the New Haven Station] for the year ending October 31, 1934, W. L. Slate (*Connecticut [New Haven] Sta. Bul. 366 (1935), pp. 59–100, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-fifth Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut, for the year ending June 30, 1933, W. L. Slate et al. (*[Connecticut] Storrs Sta. Rpt. 1933, pp. [349], figs. 53*).—This consists of reprints of Bulletins 192–198, previously noted.

Annual Report [of Florida Station], 1934, W. Newell et al. (*Florida Sta. Rpt. 1934, pp. 133+IX, figs. 15*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue. Meteorological observations in the Everglades (pp. 86–89) and at the North Florida Substation at Quincy (pp. 114–116) are also included.

Forty-seventh Annual Report of [Indiana Station], 1934, J. H. Skinner and H. J. Reed (*Indiana Sta. Rpt. 1934, pp. 95, figs. 34*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Forty-sixth Annual Report of the Kentucky Experiment Station for the year 1933, II (*Kentucky Sta. Rpt. 1933, pt. 2, pp. [2]+260, figs. 22*).—This contains reprints of Buls. 337–345, all of which have been previously noted.

Fifty-fifth Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-seventh Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1934, J. G. Lipman (*New Jersey Stas. Rpt. 1934, pp. XXIII+132*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Forty-fifth Annual Report [of New Mexico Station, 1934], F. Garcia (*New Mexico Sta. Rpt. 1934, pp. 71, figs. 13*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of the South Dakota Agricultural Experiment Station, [1934], J. W. Wilson et al. (*South Dakota Sta. Rpt. 1934, pp. 49*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report [of Tennessee Station], 1933, C. A. Mooers et al. (*Tennessee Sta. Rpt. 1933, pp. 56*).—The experimental work reported is for the most part noted elsewhere in this issue.

NOTES

Alabama Polytechnic Institute.—Dr. L. N. Duncan, director of the agricultural extension service and a member of the administrative committee which has been in charge of the institution for some time, has been appointed president.

Connecticut College.—*School and Society* notes that President Charles C. McCracken has resigned to become on September 1 educational counselor of the Presbyterian Board of Christian Education. In this capacity he will assist the 53 Presbyterian colleges to interpret their educational policies and in the fields of administration and curriculum.

Georgia Station.—J. C. Elrod has been appointed agent in agricultural economics.

Purdue University and Indiana Station.—A tract of 80 acres has been purchased as an addition to the adjoining soils and crops farm and will be available for experimental plats along these lines.

Dean and Director J. H. Skinner received the honorary degree of doctor of agriculture from the Michigan College at its recent commencement.

Kansas College.—The honorary degree of doctor of science was conferred at the recent commencement on J. T. Jardine, Chief of the U. S. D. A. Office of Experiment Stations.

Maine University and Station.—Dr. James Monroe Bartlett, head of the chemistry department of the station, died May 11 at the age of 80 yr. Dr. Bartlett was one of the first three members of the staff when the station was organized, coming from a position as analytical chemist in the Pennsylvania College on May 1, 1885, and had been continuously in its service for 50 yr. He was a native of Maine and a graduate of the university, receiving the B. S. degree in 1880, the M. S. degree in 1883, and the honorary D. Sc. degree in 1927. Elmer R. Tobey, research chemist, has been promoted to fill the vacancy as head of the department.

Maryland University.—President R. A. Pearson has resigned, effective July 1. Vice President H. C. Byrd has been designated acting president.

Massachusetts College.—Wayne Judson Lowry, instructor in horticulture since 1929, was killed in an automobile accident May 20. He was 29 yr. of age and a graduate of the Michigan College in 1928, and had received the M. S. degree from the Massachusetts College.

Michigan College.—Following the granting to the Governor of unusual authority in balancing the State budget, announcement was made by him that the college has been granted for the ensuing biennium $1,284,653.47 as compared with $1,000,000 for the previous biennium. The agricultural extension funds were reduced from $178,609.09 to $166,250.

A log cabin clubhouse in memory of the late Prof. A. K. Chittenden, head of the forestry department from 1914 to 1931, has been built by members of the local forestry club among the pines in the forest nursery.

New Hampshire Station.—F. D. Reed has resigned, effective June 1, to engage in commercial poultry work.

New Jersey Stations.—The Governor has recently reorganized the board of managers of the State station, its personnel now including 13 new members out of a total of 21.

A greenhouse to be used for the study of the significance of the so-called "rarer" elements in plant nutrition has been constructed and equipped for work under the direction of the plant physiologist.

Director Jacob G. Lipman, who has been on leave since July 1, 1934, resumed his duties on June 1. Dr. William H. Martin has been appointed director of research and will supervise research projects and budgets, effective July 1.

Dr. Gordon T. Nightingale, associate biochemist in horticulture, has resigned effective September 1 to accept a position in Hawaii.

Cornell University.—A gift has recently been made to the university by Dr. L. H. Bailey, professor emeritus of agriculture, and Mrs. Bailey of one of the most extensive herbariums in this country. This collection comprises over 125,000 mounted herbarium sheets, especially rich in cultivated material, and there are also included in the gift 4,000 technical books related to horticulture and botany, thousands of photographs, working equipment, etc., the buildings which house the collection, and about 0.25 acre of land. In accepting the gift the university has authorized the establishment of an administrative unit in the College of Agriculture to be known as the Liberty Hyde Bailey Hortorium. This will be under the direct supervision of a staff member and with a full-time curator and an advisory board consisting of the supervisor, the curator, representatives of the major fields of plant science, and two members at large. One or more graduate fellowships to be known as the Liberty Hyde Bailey Botanical Fellowships will also be established.

New York State Station.—A law enacted by the last legislature repeals the provision made several years ago for the publication of The Vegetables of New York out of the legislative printing fund, although leaving the way open for specific budget requests by the station for the printing of future monographs in the series. Thus far three parts of volume 1 have been issued, dealing, respectively, with peas, beans, and sweet corn.

A new black sweet cherry developed by the station was named the "Gil" Peck on July 3 in special ceremonies held on the station grounds. This cherry was named in honor of the late Prof. Gilbert W. Peck of the New York State College of Agriculture, extension worker in fruit growing on the Indian reservations of the State for many years, and at the request of 6,500 Indians making up the Six Nations is to be planted on these reservations as a permanent memorial to him.

E. Cooper Smith, assistant in research (chemistry), has resigned effective July 1 to accept a 2-yr. research fellowship in Cornell University.

North Dakota Station.—Appropriations by the last legislature for the new biennium were again confined to the maintenance of the physical plant.

Rhode Island College.—Under an act of the last legislature a department of education, headed by a director, is established as 1 of 11 branches of the State government. This department contains a division of education, which includes the Rhode Island State College and the Rhode Island College of Education. A board of regents for these institutions replaces the former board of managers, its personnel consisting of the Governor, the Lieutenant Governor, the chief justice of the supreme court, the director of education, and the State budget director and comptroller ex officio, also 2 alumni members of the State college, an alumnus of the College of Education, and 2 qualified electors from the First and Second Congressional Districts appointed by the Governor.

South Dakota College and Station.—Olaf A. Negaard, assistant professor of agricultural economics and assistant agricultural economist, has accepted a

position with the Market News Service of the U. S. D. A. Bureau of Agricultural Economics.

Tennessee University and Station.—S. H. Essary, associated with the botanical work of the institution since 1904 and botanist of the station since 1910, died April 28 at the age of 65 yr. He was a native of Tennessee, receiving from the university the B. S. degree in 1897 and the M. S. degree in 1907. His work with the station had dealt especially with disease resistance in clover, tomatoes, and cotton.

Texas College.—Oscar B. Martin, director of the extension service since 1928, died July 1 at the age of 65 yr. He was a native of South Carolina, graduating from Furman University in 1892, teaching in the South Carolina public and high schools from 1893 to 1902, and serving as State superintendent of education from 1903 to 1908. He was most widely known, however, because of his long association with the extension activities of the U. S. Department of Agriculture in the South, beginning in 1908 and continuing for 20 yr.

Utah Station.—P. V. Cardon, since 1928 director of the station and since May 1934 regional director of the land policy section, A. A. A., in New Mexico, Arizona, Colorado, Utah, Nevada, and California, has resigned to accept an appointment as principal agronomist in charge of the Division of Forage Crops and Diseases, U. S. D. A. Bureau of Plant Industry, with headquarters in Washington, D. C., after September 1, and succeeding Dr. A. J. Pieters.

West Virginia University.—A 2-yr. forestry course in the College of Agriculture, to be expanded when funds permit to a regular 4-yr. course, has been approved by the board of governors and is to begin with the fall term. Dr. W. C. Percival, assistant professor of forestry and Federal coordinator in land-use surveys for West Virginia, has been designated as director of the course, which was established because of the need for trained foresters, two-thirds of the land area in the State being adapted primarily for forestry purposes.

Necrology.—William Parker Cutter, librarian of the Bermuda Biological Station for Research and from 1893 to 1900 librarian of the U. S. Department of Agriculture, died in Boston, Mass., May 22. Mr. Cutter was born in Washington, D. C., December 19, 1867, and graduated from Cornell University in 1888. He had also been chemist of the Utah Experiment Station from 1890 to 1893 and connected with several other libraries. His service with the Department Library, however, was especially noteworthy, since it covered the period of reorganization and introduction of modern methods and the establishment of policies such as the development of exchange relationships, the use of printed cards, and the setting up of branch libraries. In the words of a recent tribute in *Agricultural Library Notes*, "he had a remarkable aptitude for languages, an extraordinary facility in uncovering sources of information, and was a librarian of deep and varied scholarship. The Library of the Department owes to Mr. Cutter a great debt."

Prof. Hugo de Vries, emeritus professor of botany in the University of Amsterdam and internationally known for his contributions to genetics and plant breeding, died May 20, aged 87 yr.

Passage of H. R. 7160.—This act, designed "to provide for research into basic laws and principles relating to agriculture and to provide for the further development of cooperative agricultural extension work and the more complete endowment and support of land-grant colleges", was signed by President Roosevelt on June 29, 1935. It is expected that a discussion of its provisions will appear in the September *Record*.

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EDITORIAL

THE BANKHEAD-JONES ACT OF 1935

Substantially increased Federal aid for basic agricultural research, agricultural extension, and land-grant college instruction is authorized in an act signed by President Roosevelt on June 29, 1935. For the fiscal year ending June 30, 1936, appropriations have been granted by Congress under its provisions aggregating $980,000 for land-grant college instruction, $8,000,000 for agricultural extension, and $1,000,000 for agricultural research, and under a sliding scale arrangement these amounts may be increased to an annual maximum for all purposes of $19,480,000 by the beginning of the fiscal year 1940.

The legislative history of this important measure, presumably to be popularly known as the Bankhead-Jones Act, is relatively brief. In the House of Representatives, Hon. Marvin Jones of Texas, chairman of the Committee on Agriculture, introduced H. R. 6123, authorizing additional Federal appropriations for land-grant college instruction and agricultural extension, under date of February 22, 1935, and H. R. 6981 for additional aid to basic agricultural research under date of March 25. In the Senate, Hon. John H. Bankhead of Alabama introduced on March 4 a bill of similar objectives, S. 2228. Hearings were held on the House bills on March 28 and 29 and on the Senate bill on March 29. On April 4, H. R. 7160, which had been introduced by Mr. Jones on April 1, was favorably reported by him, with amendments, from the House Committee on Agriculture. Consideration of the measure was obtained in the House by unanimous consent on May 15 following a brief explanation of its provisions, and it was then passed by that body without further discussion. Referred to the Senate Committee on Agriculture and Forestry, the measure was favorably reported, with minor amendments, by Senator Bankhead on June 5, and under his sponsorship it was taken up in the Senate on June 10 in lieu of S. 2228, which was also pending on the Senate Calendar. It was passed by the Senate without discussion on the same day, and acceptance by the House of a conference report adjusting the amendments completed legislative action on June 24.

Upon receiving the signature of the President, the act became effective as of July 1, 1935. Specific appropriation of the funds au-

thorized was also necessary, however, and this appropriation was made for the current fiscal year in the Second Deficiency Act, signed by President Roosevelt on August 12. This act carried appropriations for the full amounts authorized for the initial year. As regards the research and extension funds, the respective payments due July 1, 1935, were specifically authorized to be made upon certification by the Secretary of Agriculture prior to September 1 of formal acceptance of the Bankhead-Jones Act itself and compliance with its requirements.

The increased appropriations for subsequent years vary as to amounts with the different classes of expenditure. For resident instruction, the land-grant colleges may receive for the fiscal year 1937 not to exceed $1,480,000, for 1938 and 1939 $1,980,000, and for each year thereafter $2,480,000. For extension work, the allotments increase by $1,000,000 per annum to a continuing maximum of $12,000,000, and for research, by $1,000,000 per annum to a continuing maximum of $5,000,000. The act expressly provides that all its grants are to be in addition to sums authorized by previous Federal legislation.

Unlike earlier appropriations for resident instruction and research, the distribution of the new funds for these purposes is not by equal division among the States. For resident instruction, the basis of allotment among the several States and Hawaii is to be the ratio which their respective total populations bear to the total aggregate population, as determined by the last preceding decennial census. For extension and research, the provisions are more complicated. Of the extension funds, $20,000 per annum is to be paid to each of the several States and Hawaii, while the remaining appropriations are to be apportioned among them on the basis of their respective farm populations. No offset is required for these appropriations, but they will not become available unless offsets provided for in previous legislation have been fully met.

As regards agricultural research, the act contemplates enlarged activities by both the State experiment stations and the Federal Department of Agriculture. Sixty percent of the amount provided is to be available to the States, Alaska, Hawaii, and Puerto Rico. The basis of allotment is to be their respective rural populations, but the appropriations are also conditioned upon the making available in each case an equal amount of funds from non-Federal sources for purposes of research and for the establishment and maintenance of necessary facilities for the prosecution of such research. Sums withheld because of failure to meet this provision may be reallotted by the Secretary of Agriculture to other States and Territories up to 20 percent of their original quota. The administration of the research funds allotted to the stations is entrusted

to the Secretary of Agriculture much as in previous legislation, and 2 percent of the entire research fund is made available for such administrative purposes.

The remainder of the research fund is placed directly at the disposal of the Secretary of Agriculture, who is "authorized and directed to conduct research into laws and principles underlying basic problems of agriculture in its broadest aspects; research relating to the improvement of the quality of, and the development of new and improved methods of production of, distribution of, and new and extended uses and markets for, agricultural commodities and byproducts and manufactures thereof; and research relating to the conservation, development, and use of land and water resources for agricultural purposes." This research is to be conducted by "such agencies of the Department of Agriculture as the Secretary may designate or establish," but one-half of the special research fund thereby to be set up "shall be used by the Secretary for the establishment and maintenance of research laboratories and facilities in the major agricultural regions at places selected by him and for the prosecution . . . of research at such laboratories."

All research by the Department authorized under the act is to constitute an addition to that already provided for by existing law, but coordination of activities is prescribed so far as practicable. An important specific authorization is that of expenditures from the new funds for "the purchase and rental of land and the construction of buildings necessary for conducting research provided for in this title, for the equipment and maintenance of such buildings, and for printing and disseminating the results of research."

Thus the act has for its major purposes, in the language of the House report, "the development and extension of the agricultural research programs of the Department of Agriculture and of the agricultural experiment stations in the various States, the development and extension of the agricultural extension system, and the further endowment of the land-grant colleges." The legislation is, therefore, primarily a following of well-established precedents rather than a breaking of new ground, or, as Dr. Raymond A. Pearson, chairman of the executive committee of the Association of Land-Grant Colleges and Universities, stated in the hearings, it is largely a further assisting of "the land-grant institutions to do those things that they have been charged to do by previous acts of Congress." Although some of the individual institutions will not benefit very extensively, especially in the early years, as a whole it is a long step forward and one which should be productive of substantial returns to American agriculture and country life. One of its most significant aspects is as a concrete expression of confidence in the land-grant institutions as a group and the work they have undertaken.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies on digestibility of proteins in vitro.—VI, Some partial cleavage products from peptic digests of casein, D. B. Jones and C. E. F. Gersdorff (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 707–716*).—Continuing work of which a part has already been noted (E. S. R., 71, p. 295), this contribution from the Bureau of Chemistry and Soils, U. S. D. A., reports the separation of three cleavage products of casein after 1 hour's digestion with pepsin.

"Fraction A represents the flocculent, translucent material which gradually separated during the digestion. Fraction B was obtained by adjusting the filtrate from fraction A to pH 6. The products remaining in the solution after removal of fraction B represent fraction C. The three fractions amounted, respectively, to 21.9, 12.7, and 65.4 percent of the casein taken for the digestion. Striking differences in the amino acid composition of the fractions are noted. Fractions A and B contained no cystine. Practically all the cystine of the original casein was accounted for in fraction C. On the other hand, 87 percent of the phosphorus of the casein was accounted for in fractions A and B. Other differences, although less striking, are noted in the percentages of other amino acids, particularly of lysine and tryptophan. The percentages of lysine in fractions A, B, and C were 8.02, 10.68, and 4.52, respectively, and those of tryptophan, 0.46, 1.17, and 3.03. Fraction A corresponds in some particulars to partial cleavage products of casein previously described, and generally referred to as phosphopeptone."

Chemical reactivity of cystine and its derivatives, J. S. Fruton and H. T. Clarke (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 667–691, figs. 9*).—According to the experimental results recorded, the introduction of acyl radicals into the amino groups of cystine and cysteine increased the initial lability of the sulfur toward alkali and inhibited the labilizing action of pyruvate. The effect of acylation on the rate of decomposition varied with the negativity of the group. Dibenzenesulfonylcystine was found to be relatively stable toward alkali; its N-alkyl derivatives less so. Ring formation markedly increased lability. In diaminodiethyldisulfide, dithiodihydracrylic acid, and homocystine the sulfur was labile to alkali, but to a smaller degree than with dibenzenesulfonylcystine.

The influence of acyl groups on the rate of autoxidation of cysteine derivatives was found to be qualitatively similar to that on the lability toward alkali of the corresponding derivatives of cystine.

"The sulfhydryl-disulfide system satisfies the requirements for thermodynamic reversibility in the reaction with reversible oxidation-reduction indicators at pH 7 and higher. In all instances studied the potentials have substantially the same value, namely, about 0.23 v at pH 7. Equilibrium in the reaction between sulfhydryl compounds and dyes in their oxidized form is attained much more slowly than in the reverse direction. The rate of reaction between substituted cysteines and the dyes varies with the character of the substituent."

A study on keratin, D. R. Goddard and L. Michaelis (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 605–614*).—The authors report that "keratin dissolves in Na_2S, KCN, or thioglycolic acid at alkaline reaction. This effect is chiefly due to

the splitting of the disulfide groups, which are essential for the maintenance of the fibrous structure of keratin. Chemically, the action of thioglycolic acid is the simplest; it simply reduces the disulfide to sulfhydryl groups with no other appreciable chemical change. The other reagents act in a more complicated way. The substances thus obtained are proteins. They are soluble in alkali or acid, with a definite isoelectric point, and they are digestible by pepsin and trypsin, even when secondarily the —SH group has been reoxidized to the —SS— stage, or when due to secondary reactions the sulfur content has been greatly changed."

It is also noted that "in order to test whether the protein prepared with thioglycolic acid is completely freed from this acid the following test was applied. A suspension of the protein in sodium pyrophosphate solution is mixed with a drop of a 1-percent solution of cobalt sulfate. Any trace of free thioglycolic acid will develop, either immediately or after some time, on exposing the mixture to the air, a brown color. The sulfhydryl protein does not give this test, although it gives a positive nitroprusside test which is common for all sulfhydryl compounds. . . . The oxidized form of thioglycolic acid, dithiodiglycolic acid, can be tested for with the same reagent, adding besides some Na_2SO_3 which reduces the disulfide to the sulfhydryl compound."

The synthesis of cystinyldiglycine and cystinyldialanine, J. WHITE (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 141–144*).—Dicarbobenzoxycystinyl dichloride was prepared from dicarbobenzoxycystine by treatment of a cooled suspension in anhydrous ether with finely powdered phosphorus pentachloride. Dicarbobenzoxycystinyldiglycine was obtained from dicarbobenzoxycystinyl dichloride by acting upon it with a cooled solution of glycine in N sodium hydroxide solution. Dicarbobenzoxycystinyldiglycine was converted into cystinyldiglycine by heating its suspension in concentrated hydrochloric acid on a water bath at not more than 70° C. for about 30 min., precipitating the phosphotungstate of the polypeptide, extracting the phosphotungstic acid with ether and amyl alcohol in weak hydrochloric acid, etc. Dicarbobenzoxycystinyldialanine and cystinyldialanine were prepared by an essentially similar method.

Both of the polypeptides thus prepared responded to the Sullivan color reaction test for cystine (E. S. R., 70, p. 444). "The equivalent of 1 mg of cystine as the peptide gave a far more intense color than did 1 mg of cystine. This color was not the characteristic one obtained with cystine but was magenta in appearance. Hence it would seem impossible to determine cystine in the presence of either of these derivatives."

Varietal and other variations in peptizability of wheat flour proteins, C. E. MANGELS (*Cereal Chem., 11 (1934), No. 2, pp. 164–172*).—In this investigation from the North Dakota Experiment Station the protein peptized by normal solutions of potassium sulfate, magnesium chloride, and potassium bromide and by 70 percent alcohol was determined for a series of experimentally milled patent flours. Varietal variation in peptizability was not of large magnitude. The variation in peptizability due to environment was as great as the varietal variation. It appeared that protein peptizability tends to vary inversely as the total protein content. There was also observed a slight tendency for baking quality to vary inversely as protein peptizability, "but only one correlation coefficient approaches the horizon of significance."

The chemical and physico-chemical changes induced in wheat flour by artificial maturing agents, C. E. RICH (*Cereal Chem., 11 (1934), No. 2, pp. 201–227, figs. 6*).—The author considers that his results suggest that the poorer baking qualities of the lower-grade flours are due to contamination with germ particles, and that the improvement due to artificial maturation is caused "by some reaction which apparently involves oxidation of some constituent of the

germ content of the flour. The present study does not agree with the hypothesis that the phosphatides are the constituents responsible for this reaction but indicates that some other constituent is involved. Baking tests with straight-grade flours indicate that the maturing effect seems to be dependent to some extent on the protein content of the flour. The action of nitrogen trichloride on flours containing added bran powder and germ powder indicates that lowgradeness of flour is principally caused by germ and not by bran contamination. If lowgradeness is caused by germ instead of bran contamination, as is generally believed, then the operative miller should turn his efforts toward germ elimination instead of trying to reduce ash content by reducing bran pulverization. The baking qualities of low-grade flours can easily be improved by maturing agents, but the bleaching effect cannot eliminate the dull color of contaminated mill streams."

The isolation and distribution of nitrogen in dilute alkali-soluble proteins of healthy Valencia and Washington Navel orange fruits, W. B. SINCLAIR, E. T. BARTHOLOMEW, and R. D. NEDVIDEK (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 2, pp. 173–180*).—The authors of this contribution from the California Experiment Station and California Fruit Growers Exchange describe in detail methods used for the isolation and purification of the dilute alkali-soluble proteins from the Valencia and Washington Navel orange pulp, respectively. The distribution of the nitrogen of these proteins was determined according to the method of Van Slyke (E. S. R., 26, p. 22), as modified by various other workers. The protein from the Valencia orange pulp was found to have a nitrogen content of 15.12 percent and that from the Washington Navel orange pulp, 15.37 percent, both being corrected for moisture and ash. The basic amino acid fraction and the nonbasic fraction of the two proteins were practically the same.

"Protein from the Washington Navel orange has a slightly higher percentage of ammonia nitrogen than that from the Valencia orange, but the protein from the latter has a higher percentage of humin nitrogen. It is possible that impurities may account for the differences in the humin values. Both of these proteins were precipitated in pH 4.6 to 4.7. This is the pH range of minimum solubility as determined by the amount of protein remaining in solution after precipitating the protein at these pH values. After repeated precipitation from a 0.3-percent NaOH solution, the protein contained carbohydrate material. When the protein was distilled with 12-percent HCl, furfural was produced, which in turn yielded an alcohol-soluble phloroglucide when precipitated with phloroglucinol. When a dilute akali solution (0.3-percent NaOH) of Washington Navel orange protein was heated to the boiling temperature for 5, 10, and 20 min., respectively, a difference occurred in the rate of precipitation of the protein at its isoelectric point. Heat did not coagulate the protein."

A zinc hydroxide powder for the preparation of protein-free filtrates of blood, T. V. LETONOFF (*Jour. Biol. Chem.*, *106* (*1934*), *No. 2, pp. 693–699*).—In the method reported, "the satisfactory preparations of zinc hydroxide were made from zinc acetate and sodium hydroxide. Zinc sulfate failed to give a suitable product. Thirty-nine and six-tenths g of sodium hydroxide in 400 cc of water are added with stirring to 120 g of $Zn(C_2H_3O_2)_2 \cdot 2H_2O$ in 1,600 cc of water. After 3 to 5 min. the precipitate is filtered by vacuum and washed with distilled water until the washings are neutral to phenol red (about 1 l of water is required). The wet material is dried in air at room temperature on a filter paper or porous plate. Drying is complete when constant weight is reached and when the material can be powdered readily. It is ground to a fine powder in a mortar. The powder that has been used passes through an 80-mesh

per inch sieve and is largely retained by 100 mesh. Yields have averaged 53 g for the quantities given, calculated as $Zn(OH)_2$. A sample exposed to air 5 mo. in the laboratory retained its original effectiveness as a precipitant."

Varietal and regional variation in properties of wheat starches, C. E. MANGELS (*Cereal Chem., 11 (1934), No. 6, pp. 571–585, figs. 10*).—The author of this contribution from the North Dakota Experiment Station determined the phosphorus content of the starches obtainable from a number of varieties of wheat, and also determined the viscosities of dispersions of these starches in 0.10 N sodium hydroxide, in 1.25 M potassium thiocyanate, in 0.7 M sodium salicylate, and in 4.5 M urea. "The phosphorus content of starches from the 1928 crop was lower than that of the starches from the 1932 crop, indicating that seasonal conditions affect this factor. Nitrogen content did not vary significantly for the 2 years." "An inverse relationship between phosphorus content and swelling capacity or viscosity is indicated."

"Starches from different varieties of common wheat showed consistent variation in viscosity with the four gelatinizing agents used. The order of magnitude of viscosity for these varieties was Reward, Ceres, Marquis. Regional variation is not consistent, indicating that the cause of variation in this regard is complex in nature and not due to a single chemical or morphological factor. Seasonal variation indicates that in hot, dry seasons the wheat plant produces wheat starches less susceptible to action of swelling agents than when the starches are produced in seasons of lower temperature and more abundant rainfall."

The thermophilic fermentation of beet pulp, O. L. OSBURN, J. STRITAR, and C. H. WERKMAN (*Jour. Agr. Res.* [*U. S.*], *50 (1935), No. 2, pp. 165–172*).—In the experiments reported by the authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., and the Iowa Experiment Station, two kinds of beet pulp were used, one being the dried cossettes left after the extraction of the sugar at the factory, whereas the other was obtained by adding waste molasses to the cossettes and drying.

Mixed bacterial cultures were obtained from sod-manure compost, garden soil, and stable and sheep manure. Enrichment cultures were made by inoculating small quantities of beet-pulp broth and incubating anaerobically at 60° C. for about 48 hr. All fermentations were carried out anaerobically at 60°. In the later stages of the work the only cultures used were enrichment cultures from garden soil, the products having been practically the same in all cases.

The thermophilic fermentation of beet pulp by soil-enrichment cultures was found to be most efficient at pH 9.0 under strictly anaerobic conditions. Acetic and butyric acids, and occasionally propionic acid, were formed. The maximum yield was 53 percent of the weight of the beet pulp. The cellulose, pectin, and pentosans of beet pulp were fermented at about the same rates, although pectin appeared to be somewhat resistant to fermentation, only about 75 percent breaking down under the most favorable conditions.

***Chemistry of butter and butter making.*—II, The nature of the fatty materials in buttermilk and the significance of certain buttermilk testing methods,** E. W. BIRD, D. F. BREAZEALE, and G. C. SANDS (*Iowa Sta. Res. Bul. 175 (1935), pp. 64, figs. 5*).—Continuing this series (E. S. R., 66, p. 712), the authors extracted the fatty substances of buttermilk in quantities sufficient for analysis by means of a modified form of the Röse-Gottlieb method; calculated the phospholipin, total fat, olein (unsaturated fat), and saturated fat contents of these extracts; and estimated the sterol content. Other observations were, in part, that "the analysis of the Röse-Gottlieb extracts showed that three-

fourths of this material was fat. This, together with the apparent existence of the phospholipins in combination with proteins in milk, indicates that such measures as would reduce churning losses would not incorporate, into the butter, materials that would cause its more rapid deterioration. The Röse-Gottlieb extract of the buttermilk contained phospholipins to the extent of 0.152 percent of the weight of the buttermilk. The standard deviation of the phospholipin analyses was 0.0197 percent; this represents seasonal variation. The variation of the quantity of phospholipin which was extracted with the Röse-Gottlieb method was 0.0825 percent of the buttermilks when the fat percentages of the creams from which they were obtained ranged from 20 to 40 percent; that for a variation in cream test from 27.5 to 32.5 percent was 0.017 percent phospholipin. It was shown that an estimate of the true fat content of buttermilk can be made with slightly greater precision by applying a correction factor to the Mojonnier or Röse-Gottlieb tests than it could be by centrifugal testing methods.

"The materials read as fat by the Babcock, the American Association, and the Minnesota tests for buttermilk were analyzed for fat, ether-soluble acid materials, phospholipins, and ether-insoluble, water-soluble materials. It was shown that approximately 35 percent of the difference between the Babcock and the Röse-Gottlieb or Mojonnier methods was due to phospholipins and sterols read as fat by the ether extraction methods; the other 65 percent were caused by smallness in size of the fat particles of buttermilk. These extremely small particles cannot be centrifuged into the necks of the test bottle. . . .

"If the creameryman keeps in mind in using the American Association or Minnesota tests that not the test of his buttermilk but the percent total fat lost is the important consideration he may use either test equally well. In so doing, however, he should bear in mind that the figure representing efficient churning will vary with the testing method."

Equations comparing the Mojonnier, Minnesota, American Association, and Babcock tests are given.

The lipids of milk.—I, The fatty acids of the lecithin-cephalin fraction, F. E. Kurtz, G. S. Jamieson, and G. E. Holm (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 717–724*).—This contribution from the Bureaus of Chemistry and Soils and Dairy Industry, U. S. D. A., reports, among other observations, that "in contrast to butterfat, the lecithin-cephalin fraction of the milk phospholipides contains none of the lower fatty acids. More surprising is the entire absence of palmitic acid, which not only is one of the acids most abundant in butterfat, but is widely distributed among a great many fats and oils, both of vegetable and of animal origin. The high percentage of oleic acid shows that a considerable proportion of the phospholipide molecules contains only unsaturated acids. The indication of a dicostetrenoic acid is in harmony with recent work on the phospholipides from other sources."

Further studies on the zymogens of pepsin and rennin, I. S. Kleiner and H. Tauber (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 501–504*).—"Prorennin and propepsin (pepsinogen) become activated at distinctly different pH values; the former becomes completely active at pH 3.6 and the latter at pH 1.6 under given conditions. Partial activation of either may occur at lower H-ion concentrations."

A method for removing and determining the free iron oxide in soil colloids, M. Drosdoff and E. Truog (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 312–317*).—In the investigation here reported from the Wisconsin Experiment Station, the free ferric oxide content of soil colloids, including both the hydrated and the nonhydrated oxides, was shown to be readily converted into

a mixture of sulfides by saturating the suspension of the colloid with hydrogen sulfide and making the suspension neutral or slightly alkaline with ammonium hydroxide solution, the reaction being complete in about ½ hr. "The H_2S quickly changes the free ferric oxide by surface action to iron sulfides, which are easily soluble in dilute acid [0.1 N HCl, added in an excess of about 50 cc to about 250 cc of the suspension] and may thus be extracted and determined. Combined or silicate iron is unaffected in the limited time required, as are also other constituents and the base-exchange capacity. It was found that the amount of free ferric oxide in a lateritic soil colloid was high, in colloids from several Wisconsin soils it was less than the combined or silicate iron, and in one soil colloid and two bentonite colloids it was absent, while the combined iron oxide ranged from 4.8 to 6.3 percent. Free colloidal iron oxide may be removed directly from a soil without previous separation of the colloid as a whole. This is useful in mechanical analysis, including specific gravity separations, petrographic work, and phosphate fixation studies."

The procedures both for the separated colloids and for the whole soil are given. When it was desirable to remove the precipitated free sulfur, the residue remaining after the extraction of the free iron oxide was washed, with the aid of a centrifuge, twice with 95 percent alcohol, 3 times with a mixture of carbon disulfide (1 volume) and alcohol (2 volumes), and then again 4 or 5 times with the alcohol alone.

Gasometric microdetermination of phosphoric acid, E. Kirk (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 191–201, fig. 1*).—In the procedure detailed in this contribution from The Rockefeller Institute for Medical Research, phosphoric acid is determined by precipitation with strychnine molybdate, followed by wet combustion of the precipitate by the gasometric method of Van Slyke, Page, and Kirk (E. S. R., 71, p. 587). The phosphorus content is calculated from the carbon content of the sample. The method was found to be applicable to analyses of samples containing 0.005 to 0.02 mg of phosphorus. With samples of 0.01 to 0.02 mg of phosphorus, the average error was ±0.5 percent.

The determination of the basic amino acids in small quantities of proteins by the silver precipitation method, R. J. Block (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 457–462*).—The author has further developed the modifications made by Vickery and Block (E. S. R., 67, p. 9) in the procedure of Kossel and Kutscher (E. S. R., 58, p. 12), the new form of the method permitting "relatively accurate determinations of the bases in quantities of proteins as small as 2 to 5 g." He gives the working detail of a determination in which but 2.5 g of the protein are required. Histidine is isolated as the diflavianate, arginine as the flavianate, and lysine as the picrate. "A complete analysis may be conducted in 8 working hours after some experience has been obtained."

A modification of the method for determining methionine in proteins, H. D. Baernstein (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 451–456, fig. 1*).—As a modification of the method recently proposed by him (E. S. R., 68, p. 438), the author substitutes a solution of potassium acetate and bromine in glacial acetic acid for the alcoholic silver nitrate used in the original form of the method as an absorbent for the methyl iodide evolved. Mercuric chloride was introduced in the absorption train to remove phosphine formed from the hypophosphite used to keep the hydriodic acid reduced. Also, "a new derivative of methionine has been isolated from hydriodic acid digests of methionine in which the sulfhydryl group of homocysteine forms a thiolactone with the carboxyl group."

A manometric micromethod for arginase determination.—Enzymatic study of blood arginase in rats, L. Weil and M. A. Russell (*Jour. Biol. Chem.,*

106 (1934), No. 2, pp. 505–512, fig. 1).—Report is made of a method for determining the arginase content of blood samples of from 0.1 to 1 cc. The use of oxalates was found not to interfere with the determination, which consisted, essentially, in decomposing the urea formed from arginine by the action of the arginase by treating the urea-containing reaction mixture with urease and measuring the evolved carbon dioxide manometrically. The method was used for the determination of the arginase content of the blood of rats under various experimental conditions. Among other observations recorded, "no parallelism was found between blood arginase and blood urea content."

Gasometric microdetermination of lipids in plasma, blood cells, and tissues, E. Kirk, I. H. Page, and D. D. Van Slyke (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 203–234, figs. 6*).—"The practice of estimating blood phosphatides in the solution obtained by precipitating them with acetone-$MgCl_2$ and redissolving in moist ether has been found to give low results because of the presence of a diaminophosphatide which does not redissolve in moist ether. If the entire acetone-$MgCl_2$ precipitate is determined by carbon combustion, however, the results agree with those of the total lipoid phosphorus estimation."

Microgasometric methods for total lipides, total and esterified cholesterol, phosphatides, lipide amino nitrogen (cephalin), and total lipide nitrogen are described.

A micromethod for the determination of free and combined cholesterol, R. Schoenheimer and W. M. Sperry (*Jour. Biol. Chem., 106 (1934), No. 2, pp. 745–760, fig. 1*).—The method described consists essentially in the precipitation of the cholesterol with digitonin and the determination of the cholesterol thus isolated colorimetrically by means of the color developed on treating it with acetic anhydride and sulfuric acid. The sample required is 0.2 cc of serum or of whole blood. For working detail the original should be consulted.

A study of the absorption spectra of some carotenoid pigments at liquid air temperatures and its applications to the carotenoid pigments of cowpea leaves (Vigna sinensis), G. E. Hilbert and E. F. Jansen (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 97–105, fig. 1*).—With respect to the absorption spectra of the α- and β-carotenes, of lycopene, and of leaf xanthophyll, observed both at room temperatures and at very low temperatures, the authors of this contribution from the Bureau of Chemistry and Soils, U. S. D. A., found that "at low temperatures (1) more bands developed in the region of the near ultraviolet, (2) a certain amount of structure in the form of lines or bands was produced, and (3) as expected, because of the decrease in the heat motion of the particular portion of the molecule responsible for the absorption, the bands were sharpened considerably. They were also shifted on an average of about 150 a. u. toward longer wave lengths."

The results shown were obtained with alcohol-ether solutions containing 0.001 percent pigment. This concentration was found to give the best results at low temperatures. At room temperature a stronger solution was found desirable. "It is interesting to note that at low temperatures the absorption spectrum of recrystallized carotene from carrots, which contains about 10 to 15 percent of α-carotene, is quite similar to the spectrum of β-carotene; the centers of the absorption bands lie at 4,980, 4,635, and 4,355 a. u. and thus have been shifted about 20 a. u. toward shorter wave lengths. A similar result was obtained with a solution of pigment containing 83 percent β-carotene and 17 percent leaf xanthophyll. . . . One may . . . conclude that a byproduct whose absorption bands overlap that of the principal substance will produce an apparent shift in the bands of the principal substance in the direction of the absorbing bands of the byproduct."

The influence of environment on the carotenoid content of hard red spring wheat, A. G. O. WHITESIDE, J. EDGAR, and C. H. GOULDEN (*Cereal Chem., 11 (1934), No. 6, pp. 615–625, figs. 3*).—The authors describe, in a contribution from the Dominion Experimental Farm, Ottawa, a colorimetric method for the determination of carotenoid pigments of wheat flours. They conclude, in part, that "environment has an appreciable effect on the carotenoid pigmentation of flour milled from wheats grown under different conditions. The effect of inherent characteristics was apparent in that there was a tendency for those varieties which produced higher carotene values to be higher in kernel weight, lower in bushel weight, and higher in wheat protein. . . . There is no indication in this series that there is any correlation between flour carotene and wheat protein due to environmental factors. The necessity of subjecting varieties to comparable environmental conditions before relative values for their carotenoid contents may be obtained is apparent. It also indicates that in areas or seasons where environmental conditions tend to produce plump wheat the carotenoid content of the flour milled from that wheat should be lower than where the conditions are the reverse."

Flour particle size by the sedimentation method, M. C. MARKLEY (*Cereal Chem., 11 (1934), No. 6, pp. 654–660, figs. 3*).—This contribution from the Minnesota Experiment Station reports upon a form of the method of sedimentation upon an immersed balance pan, the liquid used being a mixture of carbon tetrachloride with cleaners' naphtha. "The density of this mixture can be adjusted to any desired level. The viscosity of this mixture is reasonably constant through wide variations in composition, and is low enough so as not to entrap air. However, it was found essential to determine density and viscosity of the mixture in use at the working temperature."

A study of the method of determining particle size by sieving through bolting cloth indicated the retention by the sieves of considerable proportions of the material of which the actual particle size was less than the size of the openings in the bolting cloth.

"These data indicate that at best sieving technic for the determination of particle size is inefficient, and that the sedimentation method offers some promise as a somewhat more accurate method. However, it should be kept in mind that sedimentation technic has certain disadvantages, namely, being slow and being unsuited for use with materials of varying densities or widely varying shapes of particles. For example, whole wheat flours would give erroneous results by this method."

The viscosity test, E. G. BAYFIELD (*Cereal Chem., 11 (1934), No. 6, pp. 637–647*).—In this investigation, reported from the Ohio Experiment Station, the degree of granulation of the flour was found to have a decided influence upon the test, particularly when no time is allowed for flour hydration between making up the suspension and running the determination. Increasing fineness of flour increased the maximum viscosity in these tests completed without delay. Digesting the suspension for 1 hr. largely eliminated the influence of varying flour granulation. From a series of tests in which the time and temperature of digestion were varied, it was concluded that 1 hr. and 30° C. gave satisfactory results. "It seems desirable to use such a digestion period in cases where a wide range in flour characteristics is expected to be encountered or in cases where protein quality alone is being determined."

Machine mixing of the flour-water suspension was found to give more uniform results than hand mixing in a mortar and pestle. Machine mixing was less desirable where a no-time method was employed, however.

Addition of various quantities of bran and flour ash to a low ash flour indicated that the composition, as well as the quantity, of the ash affects the vis-

cosity results. Tests comparing the use of a constant quantity of protein in the sample with the use of a constant flour weight sample indicated that variable quantities of protein in a sample (constant flour weight) produce large differences in the viscosity results. The use of a constant weight of protein in the sample largely eliminated these differences when a single variety of wheat was used. "Provided that ash content is held within narrow limits, the use of a constant weight of protein sample gives promise of giving a measure of protein quality."

Determination of sprout damage in wheat and rye by means of the dipping refractometer, G. MOLIN (*Cereal Chem., 11 (1934), No. 2, pp. 153–159, fig. 1*).—Directions for the test as used by one of the Swedish milling companies are given as follows: "1.25 g of flour is weighed and transferred quantitatively to a dry test tube, 3 cc of distilled water at room temperature is added, and the flour and water are mixed into a smooth paste by means of a glass stirring rod. Lump formation may be avoided by first stirring in the flour at the top and gradually working down to the bottom of the tube. The tubes are placed in a test tube rack until 5 samples have been prepared. The suspensions are stirred again just before placing in the thermostat, which should be held at exactly 62° C. Under no circumstances should the tubes be disturbed or the suspensions stirred during heating.

"Autolysis is interrupted after exactly 10 min. by transferring the tubes to the cooling bath. The time should be controlled by a stop watch. During autolysis the temperature of the water thermostat should not vary more than 0.1°. After 4 min. cooling, during which time the suspension should not be disturbed, 2 cc of distilled water is stirred into the suspension. Further dilution is now accomplished by the addition of 20 cc of distilled water, whereupon the stirring rod is removed and the tube shaken thoroughly. The tubes are now allowed to stand for 30 min. in order to facilitate filtration through the settling out of suspended material. Filter through folded filters. . . .

"The filtrate is caught in refractometer beakers, the first 4 cc being poured back to insure a clear filtrate. Filtration is continued until the beaker is filled to the ground ring (about 7–8 cc). The beakers are now inserted in the refractometer bath, which is held at 17.5°, and as soon as the prism and the beakers have adjusted themselves to the temperature of the bath the scale is read to hundredths of a division.

"In order to correct for the soluble substances preexisting in the flour, a blank determination is made as follows: Weigh 1.25 g of flour into a test tube, add 25 cc distilled water, shake 15 min. in the shaking machine, filter into a refractometer beaker, and read as above. The difference between the reading on the heated suspension and that on the blank, multiplied by 5, represents the amount of starch hydrolyzed during autolysis, expressed in percentage of the flour. Wherever possible the blank determination should immediately follow that on the heated sample. Duplicates are run in all cases, but the two samples should not be autolyzed simultaneously. The final result is given with an accuracy of 0.1 unit."

AGRICULTURAL METEOROLOGY

Relation of yield of field crops to meteorological factors in Belgium [trans. title], R. BEECE and R. WILBAUX (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 4 (1935), No. 1, pp. 32–81, figs. 14; Dutch, Ger., Eng. abs., pp. 77–81*).—This article deals particularly with a statistical method of calculating the influence of different meteorological factors on yield and predicting the yield of field crops at Gembloux.

The meteorological factors taken into account were rainfall, temperature, and solar radiation, and the crops were winter wheat, winter barley, and sugar beets, the most important crops grown in the region. Relatively high correlation between weather conditions and yield was obtained for winter wheat. The critical period was shown to be November–December for rainfall ($r = -0.704$), July for temperature ($r = +0.762$) and for radiation ($r = +0.747$). A wet period in November-December caused a decrease in yield. High temperature and strong insolation in July increased the crop. In case of barley, no significant correlation coefficient was found, the influence of weather conditions being concealed by the effect of selection. In the case of yield of sugar beets, the coefficients of correlation rose as the length of period increased, thus indicating that the sugar beet is a perfect totalizer of the action of climate. "The periods of greatest sensibility are September for rainfall ($r = +0.806$), July for solar radiation ($r = -0.581$), and June for temperature ($r = +0.416$). The sugar beet is not much affected by the amount of heat received during the growth. The weight of the crop is increased by abundant rainfall occurring in September and decreased by strong radiation in July." Temperature had no influence on percentage of sugar. "The most significant coefficients are -0.673 for rains in September and $+0.673$ for radiation in July. Dry weather in September is in favor of a high percentage of sugar; a sunny period in July reduces the sugar content." With regard to yield of sugar, "the highest coefficients are: $+0.559$ for the total rainfall in May and September and $+0.525$ for the radiation in June."

Weather and wheat yield in western Canada, J. W. HOPKINS (*Canad. Jour. Res., 12 (1935), No. 3, pp. 306–334, figs. 7*).—This is a detailed study of the influence of rainfall and temperature on wheat during the growing season in Saskatchewan and Alberta, previously noted from an abstract (E. S. R., 72, p. 298). The study demonstrated a significant correlation between yield and the amount and distribution of seasonal rainfall, but showed that the effect of rain is partly dependent upon soil conditions. The maximum influence of precipitation appears to occur in the month of June. Temperature conditions during the growing season appear to be secondary to rainfall in influencing yield. "Above-average temperatures are beneficial at the time of sowing, detrimental during midsummer, and again beneficial prior to ripening, but, as in the case of rainfall, the effect produced is influenced by soil conditions. No consistent relation is evident between either rainfall or temperature and the relative yield of early- and late-maturing varieties."

A study is being made of other factors which influence yields.

Correlation between rainfall and sugar production of POJ 2878 [trans. title], E. S. SIBINGA (*Arch. Suikerindus. Nederland. Indië, 42 (1934), No. 12, pp. 365–369; abs. in Internatl. Sugar Jour., 36 (1934), No. 431, p. 445*).—This article reports that a correlation factor (+0.88) has been found which makes it possible to forecast the yield of sugar in May and June from the October–November rainfall for Java as a whole within an error of 4 percent. Closer agreement and hence more accurate forecast was found with correlation factors for each plantation.

Climate and the grape [trans. title], E. GUYOT and C. GODET (*Landw. Jahrb. Schweiz, 49 (1935), No. 1, pp. 17–26*).—Studies of the influence of temperature, duration of sunshine, relative humidity, precipitation, and hail on yield and quality of grapes and quality of wine produced are reported, with practical applications of the results. The conditions found most favorable for yield and quality are cold winters and hot, dry summers. Yield appears to be most dependent upon the weather in July, and quality on that of September. Fifty

percent of the years giving good yields also gave good quality. Very high or very low yields may be accompanied by poor quality.

SOILS—FERTILIZERS

A new instrument for soil sampling, A. Löddesöl (*Soil. Sci., 39 (1935), No. 4, pp. 257–261, pl. 1, figs. 3*).—The sampler described and illustrated is of brass tubing having an internal diameter of 7.98 cm, and has an internal height of 20 cm from the cutting edge to the inner face of the removable endpiece, so that its capacity is exactly 1 l. A lever attachable to the handle of the endpiece provides for the application of additional force if this is necessary to drive the sampler into the soil. An exactly fitting hollow copper plunger is used to force the sample out of the cutting tube. A cap for the cutting end permits holding the sample in the instrument without loss of soil or moisture, but tins with a spring catch or rubber bags are the recommended means for transporting the samples to the laboratory.

Line drawings and a half-tone plate show the construction of the instrument and its appearance as a whole. The full-sized sampler is designed primarily for organic soils. For hard and stony soils the author recommends an instrument otherwise entirely similar but made from stainless steel tubing and of an internal diameter of but 3.57 cm, giving it a capacity of 0.2 l.

An improvement in the hydrometer method for making mechanical analyses of soils, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 319, 320*).—The author of this note from the Michigan Experiment Station has improved his hydrometer method (E. S. R., 57, p. 710) by providing for the breaking of the froth, which has heretofore caused inconvenience in the reading of the hydrometer at the end of the first 40 sec. of settling, the observation having been made that a drop either of ether or of one of the higher alcohols (preferably amyl alcohol) eliminates almost constantly an otherwise persistent foam.

"The best time to add the amyl alcohol or ether is when the cylinder containing the dispersed and shaken suspension is placed on the table preparatory to taking the hydrometer reading at the end of 40 sec. The drop of alcohol or ether is placed on the froth, which disappears instantly, and the hydrometer is then immediately inserted into the suspension column and the reading taken at the end of 40 sec."

The ammonium carbonate method of dispersing soils for mechanical analysis, A. N. Puri (*Soil Sci., 39 (1935), No. 4, pp. 263–270*).—The author describes an ammonium carbonate method of dispersing soils for mechanical analysis. The procedure consists in boiling the soil with N ammonium carbonate solution and continuing the boiling after the addition of some sodium hydroxide or lithium hydroxide. The method has been shown to give maximum dispersion with all types of soils, including laterite and humus. This method "cannot be called too drastic, because boiling is already a standard procedure in the International method. The author has attempted to include all types of soils available, but the possibility of others presenting peculiar difficulties is not remote. The ideal method that would succeed with all types of soils (and of soil scientists) may still await discovery, but the present method seems to be a step in the right direction."

A simpler method of expressing the mechanical analysis of many common soils, R. L. James (*Soil Sci., 39 (1935), No. 4, pp. 271–275, fig. 1*).—In a contribution from the Canterbury Agricultural College, New Zealand, the author reports the observation that the plotting of percentage of soil material

left in suspension against time of hydrometer reading yields a smooth curve, and that by plotting the logarithms of the percentage in suspension and of the time a straight line, in each case characteristic of the soil in question, is obtained. He, therefore, proposes to express the mechanical analysis of soils as the percentage of material in suspension after 1 min. ("fine material") and the slope of the straight line ("settling rate"), and notes that "from these two numbers the straight line can be reproduced at any time, and the amount of fine silt, coarse clay, etc., can be read off." He briefly discusses the mathematical theory underlying the method and, with respect to its application, notes, in part, that "it is easier to classify soils according to two properties than according to seven, and it is easier to take two or three readings than seven. Although readings of the hydrometer taken at 5, 15, and 30 min. would give the straight line and the complete mechanical analysis in a quarter of the usual time, it is obviously unwise to shorten the analysis until a great deal of confirmatory work has been done. Exceptions are bound to occur (perhaps with pure clays or pure silts), and these may not always be easily recognizable. Again a soil could be made up to show an irregular settling curve. However, if the mechanical composition of only a quarter of the world soils (this paper records 26 out of 29 examined) can be expressed completely by the quantities fine materials and settling rate so that they are more capable of practical interpretation in their relation to tilth, water-holding capacity, suitability for drainage and irrigation, strength in foundations, porosity in dams, etc., the result is a very tangible one."

Soil survey of the Dixon area, California, S. W. Cosby and E. J. Carpenter (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1931, No. 7, pp. 47, pl. 1, figs. 4, map 1*).—The Dixon area, Calif., includes 278,400 acres located in Solano and Yolo Counties in the north-central part of the State and characterized by a wide variety of physiographic features. The soils represent 13 series and include 21 soil types, with 3 classes of undifferentiated and miscellaneous materials. The most extensive type, Capay clay, occupies 15.5 percent of the tract surveyed.

The survey was made in cooperation with the California Experiment Station.

Soil Survey of Iowa.—Reports 74–76, P. E. Brown et al. (*Iowa Sta. Soil Survey Rpts. 74 (1935), pp. 64, figs. 18, map 1; 75, pp. 64, figs. 26, map 1; 76, pp. 64, figs. 18, map 1*).—The three reports here noted continue the series (E. S. R., 73, p. 157), recording survey data obtained in Poweshiek, Guthrie, and Hancock Counties, respectively, which supplement the Federal soil surveys (E. S. R., 71, p. 751; 70, pp. 584, 585) by including data obtained from greenhouse and field experiments and discussions of the needs of the various soils.

Soil survey of Tioga County, Pennsylvania, B. H. Hendrickson et al. (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpt.], Ser. 1929, No. 30, pp. 47, pl. 1, figs. 2, map 1*).—Tioga County, in north-central Pennsylvania, on the New York State line, has an area of 730,880 acres of rolling to hilly lands forming a part of the Allegheny Plateau and having a drainage of the dendritic pattern.

The soils found in the survey here reported, made in cooperation with the Pennsylvania Experiment Station, constitute 23 series and include 46 types with numerous phases. Fremont gravelly silt loam, covering 9.6 percent of the area of the county, is the most extensive single type described, but rough stony lands, for the most part the stony loams of the Leetonia and Lordstown series, "important for forestry purposes", occupy 18.3 percent.

Studies of nitrogen fixation in some Michigan soils, L. M. Turk (*Michigan Sta. Tech. Bul. 143 (1935), pp. 36, figs. 7*).—This bulletin reports a detailed study of nonsymbiotic nitrogen fixation in Michigan soils; soil tumbler, culture solu-

tion, and plate and plaque methods having been used for the work on the aerobic group, soil tumbler and culture solution methods for the anaerobic organisms.

The experiments reported upon "show conclusively that Michigan soils are quite well supplied with bacteria of one sort or another, capable of fixing nitrogen under favorable conditions. The results indicate that anaerobic bacteria are of greater importance than aerobic bacteria, largely due to their more general distribution. However, where aerobic fixation occurs it is usually greater than anaerobic fixation. Consequently, it is desirable under field conditions to make the environment as favorable as possible for the aerobic group. . . . The nitrogen-fixing capacity of soils is favored by a well-aerated condition; presence of $CaCO_3$, potassium salts, and phosphates; carbonaceous material of the right kind; proper moisture relations; and favorable temperature. Therefore, in any soil management system consideration should be given to the provision of such conditions favoring this process by which free nitrogen is added to the soil. . . . The individual farmer may, by applying lime and fertilizers and returning all crop residues as far as possible, greatly increase the yield of his crops, and at the same time make the soil conditions more favorable for these nitrogen-fixing organisms."

Conversion of soil potash from the non-replaceable to the replaceable form, F. A. E. Abel and O. C. Magistad (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 437–445*).—Two experiments on eight pineapple soils, all derived from basaltic lavas, were conducted in a greenhouse at the Hawaii Pineapple Experiment Station. In the first experiment successive crops of soybeans were grown on two soils, one well supplied with and one deficient in replaceable potassium and each with and without lime. The soils in this experiment received no potassium as fertilizer but did receive nitrogen and phosphorus. A balance sheet of readily available potash was kept. In a second experiment similar to the first, six diverse soils were used, two pots of each soil, limed and unlimed, having been cropped with sorghum. One set of each soil remained fallow.

It appeared that "about 100 lb. of K_2O per acre-foot was made available from nonreplaceable sources annually in the case of limed soils and about 75 lb. in the case of natural acid soils. The results were of the same order in the case of fallow soils, and with soils cropped with legumes on the one hand and nonlegumes on the other." Soils having a very low content of replaceable potash at the beginning of the test "were able to release potash from nonreplaceable sources as readily as soils rich in replaceable potash."

A study of phosphorus penetration and availability in soils, L. A. Brown (*Soil Sci., 39 (1935), No. 4, pp. 277–287, fig. 1*).—The data obtained in the investigation here reported from the Pennsylvania State College showed that biennial surface applications of superphosphate penetrate not more than 2 or 3 in., perhaps much less, in 16 yr. Rock phosphate applied in the same manner was found to have penetrated more than 7 in. Eight yr. after the last application of rock phosphate and 3 yr. after the last superphosphate application the rock phosphate pasture contained 188 lb. per acre of available phosphorus, the superphosphate plat 18 lb. per acre, the rock phosphate applications having contained 4 times as much phosphorus as did superphosphate applications.

"Laboratory percolation studies show that more phosphorus is available in rock phosphate-treated soils of wide range of pH and treated with various nitrogen carriers than in the same soils treated with superphosphate. Rock phosphate penetrated more rapidly than superphosphate in an acid soil, but the reverse was true in alkaline soils. Ammonium sulfate or sodium nitrate

speeded the penetration of rock phosphate more than that of superphosphate, especially in an acid soil.

"The field and laboratory penetration studies all show more soluble phosphorus in rock phosphate-treated soils than in superphosphate-treated soils. In most field tests in which a comparison has been made of superphosphate and rock phosphate, however, superphosphate has proved the better phosphorus fertilizer."

Divergent influence of degree of base saturation of soils on the availability of native, soluble, and rock phosphates, R. L. Cook (*Jour. Amer. Soc. Agron.*, *27 (1935), No. 4, pp. 297–311, figs. 3*).—The author of this contribution from the Wisconsin Experiment Station compared the effects upon the growth, both of crops normally of a high calcium content and of crops which normally contain relatively little calcium, of adding hydrogen-saturated and calcium-saturated base-exchange material to pot cultures with and without added rock phosphate.

"It is concluded that, in accordance with the law of mass action, hydrogen-saturated exchange material greatly increases the availability of rock phosphate to crops low in calcium, such as oats, corn, and millet, but not, generally, to crops high in calcium, such as buckwheat. Increase in base saturation through the application of lime to seven soils resulted over a period of 1 to 20 days in significant increases in amounts of readily available soil phosphates. In two other soils there were slight increases. With the same soils, lime helped to preserve the availability of added soluble phosphates. Increasing additions of lime to five acid soils consistently lowered the power of these soils to fix added soluble phosphate in a difficultly soluble form. The results support the contention that an increase in base saturation of soils lowers the immediate availability of rock phosphate to crops like corn and oats but, on the other hand, tends to keep native soil phosphates and those added as soluble salts in the form of calcium phosphate rather than the less available basic iron phosphates."

The use of fertilizers: A guide to the manuring of crops in Great Britain, A. S. Barker (*London: Oxford Univ. Press, 1935, pp. X+204*).—The author indicates that "this book is not intended as a contribution to the purely technical literature", and further states that "the object . . . is to consider our technical knowledge of fertilizers in its economic and practical implications and in the light of the practice of farmers and growers where data established by experiment are not available." The book is "primarily intended for farmers, fertilizer sellers, and agricultural students, i. e., those chiefly interested in the commercial aspects of the use of fertilizers."

The contents are the feeding of plants, the plant foods supplied by fertilizers, nitrogenous fertilizers, phosphatic fertilizers, potassic fertilizers, mixed and compound manures, the handling and storage of fertilizers, the application of fertilizers, the valuation and purchase of fertilizers, economics of the use of fertilizers, and guide to the manuring of farm crops.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1934, C. S. Cathcart (*New Jersey Stas. Bul. 582 (1934), pp. 16*).—This bulletin continues the report begun in Bulletin 578 (E. S. R., 72, p. 592), containing "the remaining analyses, together with a discussion of the whole inspection", and supplementary information for the guidance of purchasers.

AGRICULTURAL BOTANY

Some physical and chemical considerations on plant nutrition and growth, B. V. Nath (*Cur. Sci. [India], 2 (1934), No. 12, pp. 486, 487*).—The

author points out that the physical-chemical interpretations which are able to explain the intake of nutrients by plants in water cultures are not applicable to plants growing in the soil, and holds that in the light of investigations now under way in India and elsewhere the present ideas on nutrient intake must be revised.

Hydrogen ion concentration and the intake of nitrogen by rice plant, R. H. Dastur and V. V. Kalyani (*Indian Jour. Agr. Sci., 4 (1934), No. 5, pp. 803–831, figs. 5*).—As a result of their study in 1933, Dastur and Malkani (E. S. R., 69, p. 796) revealed that as the rice plant ages the absorption from nutrient salt solutions of the ammonium ion progressively decreases and that of the nitrate ion progressively increases, while the solution becomes more acid from the fact that more of the ammonium ions than the sulfate ions are absorbed. A study was undertaken to find out whether the changing rate of the ammonium ion and the nitrate ion absorption may be due to changes in the pH of the root cells. In the first part of the study the pH of the soil and of the rice roots and leaves was determined for plants supplied with ammonium sulfate alone, sodium nitrate alone, and a mixture of the two on an equal nitrogen basis in comparison with untreated control plants. In the second part, solutions containing sodium nitrate alone, ammonium sulfate alone, and a mixture of the two were tested to determine the pH, after which the rice seedlings were kept in the solutions for 1 week and the pH again determined. The third part of the study was devoted to the determination of the isoelectric points of the principal proteins of rice roots and leaves by the rates of diffusion of the chloride ion from living tissues kept in solutions of different pH as determined electrometrically at 32° C.

The pH of the rice roots in all cases was found at first to rise, then to fall to a minimum in late August, and to rise again to the maximum value by mid-September, after which it declined gradually. With the leaves, the pH rise began in August, then began to fall at the end of that month, reaching the minimum in mid-September, after which it rose to a second maximum the second week of October, falling afterward. Thus the pH minima of the roots coincided with the maxima of the leaves. The pH values of the roots fluctuated more widely than those of the leaves. The pH of the soil decreased up to the end of July, rose to the end of August, then fell in the first week of September, after which it rose in mid-September, fluctuated a little, then began to fall. The pH of soil or of culture solutions was always highest with sodium nitrate, lowest with ammonium sulfate, and intermediate where they were mixed.

The isoelectric point of the plant tissue was found to lie between pH 4.1 and 4.4. The pH value of the roots during early growth (pH 4.09–6.18) was on the alkaline side of the isoelectric point of their proteins, which latter will combine more readily with the basic (ammonium) ions than with the acidic (nitrate) ions. Hence the ammoniacal nitrogen was absorbed during early growth, while the nitrate ions were absorbed very little. The reverse proved to be the case during later stages of growth. Therefore, the root proteins, being on the acidic side of the isoelectric point, absorbed the acidic ions in preference to the basic ions, thus explaining the observed phenomena.

The transpiration of wheat as a function of the climatic factors [trans. title], L. Manzoni and A. Puppo (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 11, pp. 1066–1068*).—Wheat plants were grown in pots. The total transpirational loss and the statistical relation between transpiration and climatic factors were determined. The loss from the average plant was 1,160.6 g, or 472.4 g per gram of dry seed in the average head. Transpiration was computed in terms of loss per square decimeter of plant surface area. Weighings were

made daily up to the time that the culms began to dry, 185 days. Coefficients of correlation were calculated for transpiration, as affected by climatic factors, as follows: Solar radiation $r=+0.882$, evaporation $r=+0.796$, temperature $r=+0.660$, relative humidity $r=-0.538$, rainfall $r=-0.280$, and wind velocity $r=+0.18$. Coefficients of partial correlation were also calculated, but these differed little from the former. Regression equations for transpiration as a function of (1) solar radiation only and (2) all climatic variables were calculated. Either equation enabled calculation of transpiration loss within 25 percent of observed loss.—(*Courtesy Biol. Abs.*)

The origin, composition, and structure of cellulose in the living plant, W. Seifriz (*Protoplasma, 21 (1934), No. 1, pp. 129–159, pl. 1, figs. 18*).—Aided by seven specialists, the author reviews recent contributions on this subject under the following headings: The plant cell wall, gross anatomy of the wall, chemical constitution of the wall, the origin of the wall, the cell wall as a living system, developmental changes, the digestibility of cellulose, mechanical properties of the cell wall, molecular structure, crystalline structure, colloidal structure, polarization studies, dark-field observations, and microscopic dissection. He calls attention to the perfect correlation and mutual support presented by the results of the various methods of attack on the cellulose problems, which give us a picture of the macroscopic fiber of natural cellulose as formed through the successive bundling together of linear units of molecules, micelles, supermicelles, fusiform bodies, and fibrils, which "assemble parallel to each other on the same plane and form lamellae", the latter piling up one on the other to form the cellulose mass. There is a bibliography.

The method of formation of aleurone grains in the Gramineae and the production by them of oxyflavone and anthocyanin compounds [trans. title], J. Chaze (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 9, pp. 840–842*).—The formation of aleurone grains from vacuoles is traced in *Avena*, *Hordeum*, *Secale*, *Triticum*, and *Zea*. Oxyflavone compounds were, at first, demonstrable in these vacuoles. In a variety of maize with black kernels these compounds quickly disappeared and gave place to anthocyanin pigments with the maturation of the grain.

The culture of cambial tissue [trans. title], R.-J. Gautheret (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 25, pp. 2195, 2196*).—Neoplastic growth was induced in sterile fragments of the cambium and phloem of 10 different tree genera by placing the explants on cotton saturated with Knop's solution with glucose and mannite added. Best results were obtained with *Populus*, *Acer*, *Ulmus*, and *Salix*. The elongated and regularly oriented cells of the original tissues divided to form masses of small more or less isodiametric elements, which during the later stages of their development may form chlorophyll and nests of lignified parenchyma. Explants of *A. pseudoplatanus* were observed to grow together and fuse into a single undivided mass. Tissue cultures of this type may prove to be of some significance in the study of callus formation and grafting.—(*Courtesy Biol. Abs.*)

Studies in the reduction of silver nitrate by the chloroplasts [trans. title], R. Gautheret (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 13, pp. 1252–1254*).—Chloroplasts were found to reduce silver nitrate as well as other silver salts, indicating that the silver ion is the reactive element involved. Contrary to the opinion of [H.] Molisch, light was found to be an important factor in this reduction. Some variation was shown in the degree of the reaction, depending upon the age and the kind of plants used as well as on the presence or absence of light. Red light of the same intensity is more effective than other visible wave lengths. After the silver has been reduced, the chlorophyll can be

extracted, and this seems to show that chlorophyll acts only as a catalyzer. *Molisch's hypothesis that it is the aldehyde formed by the chloroplasts which* reduces the silver is not substantiated. That the reaction occurs in living cells and not in nonliving cells as claimed by Molisch was found to be true.—(*Courtesy Biol. Abs.*)

Studies on the idioblasts of the family Crassulaceae [trans. title], M. PRONER (*Compt. Rend. Acad. Sci.* [*Paris*], *198* (*1934*), *No. 21, pp. 1872–1874*).—From an examination of 43 species of the Crassulaceae, the author found that the presence of specific idioblasts is characteristic of all six subfamilies.

These are found in the leaves and stems, have an undifferentiated membrane, peripheral protoplasm, and a large, highly refractive vacuole. In the leaves of all the species examined the idioblasts contained acetaldehyde. The contents of the idioblasts were principally phloroglucotannoids but in some genera consisted of tannins probably derived from dihydroxybenzene. The greatest daily change in H-ion concentration (increase in pH between morning and evening) occurred in those species which had the most idioblasts, gave a blue color reaction with alkalies, contained acetaldehyde in large quantities, and had ferments capable of decomposing *a* ketonic acids.

The author, therefore, is led to attribute to the idioblasts the role of biochemical regulators in the process of respiration, especially in the phase of combustion of organic acids.—(*Courtesy Biol. Abs.*)

Histological characteristics of plants grown in toxic concentrations of boron, I. E. WEBBER (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 3, pp. 189–194, pls. 4*).—These studies were conducted mostly with plant materials grown in sand cultures supplied with controlled chemical nutrient solutions at the Rubidoux Laboratory of the U. S. Department of Agriculture at Riverside, Calif.

Manifestations of boron toxicity which were found characteristic of some plants were lacking in others, indicating that a toxic concentration of boron in the nutrient solution is not a stimulus to a specific reaction reflected as a specific histological change. Histological evidences of injury by boron in lemon, grape, prune, and apricot leaves, and prune, peach, and apricot stems are similar to those attributable to other causes, suggesting that the observed abnormalities are correlated with the inherent capacity of a species to respond to stimuli. Chloroplasts, when present, were affected first in cells undergoing progressive degeneration of the protoplast, probably due to excessive concentration of boron in the cell.

Contributions on the morphology of the variegated plants [trans. title], E. KÜSTER (*Biol. Zentbl.*, *54* (*1934*), *No. 1–2, pp. 89–95, figs. 5*).—Information is presented with regard to difference in surface growth and thickness between pale and green portions of variegated leaves observed on the following plants: *Acer negundo*, *Spiraea bumaldiana*, *Hibiscus cooperi*, *Polygonum cuspidatum*, *Mentha rotundifolia*, *Sambucus nigra*, *Aesculus carnea*, *Acer pseudoplatanus serratum*, and *Prunus pissardi hesseï*. These differences range from cases in which the green or colored portions grow faster than the paler portions to those in which the opposite is true. Various theories to account for the variations in type of growth are set forth and certain comparisons are made with variegations due to mosaic. A striped type of variegation is observed on *Pennisetum latifolium* similar to that reported previously for *Eulalia japonica* [=*Miscanthus sinensis*] and *Coix lacryma*.—(*Courtesy Biol. Abs.*)

GENETICS

A tetraploid hybrid of maize and perennial teosinte, G. N. COLLINS and A. E. LONGLEY (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 2, pp. 123–133*).—A tetraploid plant occurring among F_1 hybrids between perennial teosinte (*Euchlaena*

perennis) and waxy corn (*Zea mays*) was more cornlike morphologically than the usual triploids of the same parentage. The 40 chromosomes of the somatic tissue of the tetraploid plant are believed to be made up of 20 (the normal haploid number) from the perennial teosinte and 2 sets of corn chromosomes. The relative frequency of autosyndesis and allosyndesis could be measured by the percentage of gametes carrying the recessive gene *wx* introduced with the corn parent. The coefficient of autosyndesis is calculated by the formula

$$t=\frac{1-6x}{1-2x}$$

where x=the ratio of recessive gametes. With this measure complete autosyndesis=1, random pairing=0, and complete allosyndesis=−1. Classification of the pollen of the tetraploid F_1 gave t=0.80, the mean value of t in F_2 plants was 0.77, and 9 F_3 progenies gave means ranging from 0.54 to 0.82. The percentage of waxy pollen in F_2 and F_3 plants with 2 dominant *Wx* genes was much more variable than in plants with 1 *Wx* gene, which is attributed to individual variation in autosyndetic attraction. The variations in autosyndesis seemed to be inherited.

Genetics (*[Connecticut] Storrs Sta. Bul. 199 (1934), pp. 20–22*).—Brief reports are given of studies on embryonic and postembryonic growth, and mortality due to the lethal genes in the creeper and Cornish game fowl, an analysis of rumplessness and intermediate rumplessness in the fowl, linkage relationships between creeper and single-comb traits, production of rickets and influence of aqueous bone extract on bone growth in creeper and normal chickens, and the regulation of body temperature in the Frizzle fowl.

The progeny test as a means of evaluating the breeding potentialities of farm animals, H. D. Goodale (*Amer. Nat., 67 (1933), No. 713, pp. 481–499, fig. 1*).—The author discusses the merit of the progeny test as a means of evaluating farm animals, especially dairy cattle, in which characters of economic importance may be accurately measured. The transmitting potentialities are suggested as the point below which the daughters have production above their dams and above which the daughters' production is less than that of the dams.

Cell division in the sheep, H. A. Bruce (*Penn. Acad. Sci. Proc., 8 (1934), pp. 53, 54*).—Examination of the number of chromosomes from the testes of sheep showed it to be approximately 60. Very little mitotic activity takes place in the testes of sheep of varying ages between birth and 3 mo., but spermatogonial mitosis is prominent at from 4 to 5 mo., and increasing numbers of sperm are formed thereafter.

The inheritance of dichromatism in the deer-mouse, Peromyscus maniculatus blandus, L. R. Dice (*Amer. Nat., 67 (1933), No. 713, pp. 571–574*).—In matings of gray and buff deer-mice at the University of Michigan it was found that gray behaved as a simple recessive to buff, but there were color modifiers producing some intermediates.

Progeny testing in poultry breeding as a means of evaluating the breeding potentiality of an individual, M. A. Jull (*Amer. Nat., 67 (1933), No. 713, pp. 500–514*).—In progeny testing of poultry the mean egg production of the daughters of the mating of a given sire and a given dam was found to be the index of greatest value in determining the breeding potentiality of an individual sire or dam, surpassing the value of the records of brothers and sisters as an indication of the breeding potentialities of an individual.

Crossing production and exhibition Rhode Island Reds, F. A. Hays (*Amer. Nat., 67 (1933), No. 713, pp. 539–548*).—A genetical analysis is reported of the exhibition and production strains of Rhode Island Reds involved in crossbreeding work at the Massachusetts Experiment Station.

The results indicate that early sexual maturity, high intensity of production, and winter pause behave as dominants. The genotype of the exhibition sire employed in the test was *Eee'e'iiI'i'MmAaCcpp*, whereas the production dams carried, in general, *E*, *I*, and *P*, the factors for early maturity, winter clutch size of three or more, and persistency of production.

A proposed classification for types of twins in mammals, G. W. D. Hamlett and G. B. Wislocki (*Anat. Rec., 61 (1934), No. 1, pp. 81–96, figs. 2*).—Various species of mammals are grouped according to those which normally discharge 1, 2, or more ova at an ovulation. These groups are further subdivided into those in which the ova develop either independently, with fusion of the membranes, or with combinations of the above.

"Synchorial twins" or "synchorial litter mates" are terms proposed to indicate fusion of the membranes of separate embryos as contrasted with "autonomous twins" and "autonomous litter mates" to designate cases in which fusion does not occur.

Remarks on synchorial litter mates in a cat, G. B. Wislocki and G. W. D. Hamlett (*Anat. Rec., 61 (1934), No. 1, pp. 97–107, pls. 2*).—In the examination of 19 uteri of pregnant cats, one case was found in which the membranes of 2 embryos from separate ova were fused. No hormonal effect of the male on the female fetus was demonstrable.

Cyclical changes in the vagina and vulva of the ferret, F. H. A. Marshall (*Quart. Jour. Expt. Physiol., 23 (1933), pp. 131–135, pls. 3*).—The changes which occur in the vagina and vulva of the ferret during 12 successive stages from anestrum through pregnancy, parturition, and lactation are briefly described.

Notes on ovulation and fertilisation in the ferret, J. Hammond and A. Walton (*Jour. Expt. Biol., 11 (1934), No. 3, pp. 307–319*).—The results of studies are reported from the University of Cambridge on the time of ovulation, ascent of spermatozoa up the genital tract, and fertilization in the ferret.

These results showed that ovulation occurred at about 30 to 36 hr. after coitus. Vulval swelling ceased about 30 to 36 hr. after ovulation. By studying animals slaughtered from 3 hr. to 10 days after the beginning of coitus it was found that spermatozoa were present in the ovarian capsule 6 hr. after mating, and sperm were found in the vulva from 6 to 36 hr. after mating. No sperm were found in any part of the genital tract of the female 10 days after coitus.

Five experiments with 19 females in which artificial insemination was attempted, followed by mating with a vasectomized male, were unsuccessful.

The results of several experiments indicated that the ovum of the ferret remains capable of fertilization for not more than 30 hr. after ovulation. Only a small portion remain capable of fertilization after 18 hr.

Pregnancy during the anoestrous season in the ferret, J. Hammond and A. Walton (*Jour. Expt. Biol., 11 (1934), No. 3, pp. 320–325*).—Continuing the above studies of the reproduction process in the ferret, accounts are given of pregnancies and pseudopregnancies which extended into the anestrus period. The latest date at which estrum was observed in the ferret was August 28, and several normal pregnancies and pseudopregnancies extending beyond this date are noted. Corpora lutea persisted and young were born normally.

The effect of irradiation with different wave-lengths on the oestrous cycle of the ferret, with remarks on the factors controlling sexual periodicity, F. H. A. Marshall and F. P. Bowden (*Jour. Expt. Biol., 11 (1934), No. 4, pp. 409–422, figs. 3*).—Studies were made in 1932–33 and 1933–34 on the acceleration of estrum by irradiation with ultraviolet, green, red, yellow, infra-red, and violet lights for 8 hr. daily during the gestation period, beginning December 23 and November 1 in the respective years.

The acceleration of the occurrence of the estrous period was as great as 141 days with ultraviolet light but somewhat less with green, red, and yellow lights. Little or no acceleration in the occurrence of the estrous period resulted from the other rays.

Reproduction activity is considered to be due to light radiations of a particular wave-length or intensity.

A type of maternal behaviour in the normal oestrous female rabbit, C. W. Bellerby (*Quart. Jour. Expt. Physiol., 24 (1934), No. 1, pp. 77–83*).—Data are reported on the nesting habits of rabbits which show that isolated females frequently make nests during the normal estrous period, although this is not identical with the behavior observed in the pregnant or pseudopregnant doe. Such behavior is not associated with specific changes in the ovaries or uterus. Nesting does not occur in ovariectomized animals, but is more frequent among hysterectomized animals than in normals.

The effect of light on ovarian activity in the rabbit, G. K. Smelser, A. Walton, and E. O. Whetham (*Jour. Expt. Biol., 11 (1934), No. 4, pp. 352–363, figs. 2*).—Because of the transitory nature of the follicles in the ovaries of the immature rabbit, as determined in two series of experiments at the University of Cambridge, counts of the number of corpora lutea present after double laparotomy, following matings with vasectomized bucks, were found to give a more reliable measure of ovarian activity.

Twelve does were placed in comparable cages after mating with vasectomized bucks. One-half of the cages were darkened and the other half lighted during the pseudopregnant period. After 30 days the does were again mated. Double laparotomies were performed 1 day later and the number of corpora lutea present determined. The rabbits subjected to light and darkness were reversed for another 30-day period before a second laparotomy was performed. Subsequently, they received different amounts of light in three further test periods. While there were more ova matured in the exposed rabbits, there was some question of the significance of this, especially if the does in which no ovulation occurred were eliminated.

The effect of unilateral castration on the remaining testis of the mouse, I. W. Rowlands (*Jour. Expt. Biol., 11 (1934), No. 4, pp. 402–407, figs. 3*).—Unilateral castration of 92 male mice, ranging in age from 41 to 222 days, and 20 immature mice 14 days of age did not result in hypertrophy or microscopic changes in the remaining testicles after from 14 to 100 days when the adults were killed, or after 31 days when the immature animals were killed.

Quantitative variation of the anterior pituitary hormone, "APH-B", in the blood during pregnancy, W. P. Kennedy (*Quart. Jour. Expt. Physiol., 23 (1933), pp. 367–372, fig. 1*).—Studies of the amount of the gonadotropic anterior-pituitary hormone present in the blood plasma of 75 pregnant women, determined by intraperitoneal injections into immature mice, showed that the entire amount of the hormone present increased during the first 30 weeks of pregnancy, after which the increase was irregular.

The mouse-unit of anterior pituitary hormone B, W. P. Kennedy (*Quart. Jour. Expt. Physiol., 23 (1933), pp. 373–379*).—The results of studies of the influence of different size doses of the anterior-pituitary luteinizing hormone on mice showed that but one-tenth of the amount of the hormone is required to give a positive test when administered in 6 doses over a 36-hr. period instead of as a single dose.

"The mouse-unit of anterior-pituitary hormone B (prolan B) is defined as the amount which, divided into 6 doses and injected intraperitoneally into 10

female mice exactly 3 weeks old, over a period of 36 hr., will produce hemorrhagic follicles in 50 percent of the animals 100 hr. from the first administration."

FIELD CROPS

[Field crops experiments by the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 199 (1934), pp. 8, 9*).—Brief progress reports are given on trials of pasture grasses and legumes; the effects of fertilizer treatments on the soil, flora, and production of permanent pastures; the effect of nitrogen on the yield of dry matter and protein of timothy hay; and fertilizer experiments with potatoes.

Annual fodder and silage crops for Nebraska, W. E. Lyness and T. A. Kiesselbach (*Nebraska Sta. Circ. 52 (1935), pp. 8, figs. 4*).—Yields and other information are reported for annual forage crops tested at the station during recent years. In a 6-yr. test, 1928–34, Atlas sorgo proved superior to other sorghums and to corn when grown in normal cultivated rows, yielding 5.54 tons of cured fodder per acre v. 2.32 tons for corn, with corresponding silage yields calculated on the basis of 75 percent moisture 18.84 and 7.89 tons. Hegari yielded 4 tons more silage and 1 ton more cured fodder per acre than corn in a 3-yr. test. When drilled for cured forage 1921–34, 4 sorgos averaged from 4.24 to 4.97 tons per acre, Sudan grass 3.01, common millet 2.82, and German millet 3.2 tons. The most productive soybean, Illini, yielded about 80 percent as much cured forage as alfalfa and 45 percent as much as Black Amber sorgo during the period 1930–32. Black Amber sorgo and Sudan grass when drilled during 8 yr. averaged more forage than when broadcasted or grown in cultivated rows. Planting period and seeding rates are indicated for forage crops.

Philippine bibliography of the minor crops of the Philippines, compiled by B. Hernandez and L. Estrella (*Manila: Bur. Sci. Libr., 1934, pp. II+166+III*).—Resembling an earlier publication on the major crops (E. S. R., 70, p. 321), this bibliography lists 112 references on fruits in general, on annonaceous fruits (custard-apple, sugar-apple, soursop) 17, artocarpus fruits (breadfruit, jack fruit) 17, avocado 20, banana 67, caimito 3, cashew 16, chico (*Achras sapota*) 6, citrus 107, duhat (*Eugenia jambolana*) 7, guava 8, lanzon (*Lansium domesticum*) 24, mango 58, mangosteen 5, papaya 39, pineapple 55, tamarind (*Tamarindus indica*) 5, and watermelon 8; on vegetables in general 85, beans 37, cabbage 7, eggplant 11, lettuce 4, mushroom 6, onions 13, petsai 3, radish 4, squash 3, and tomato 11; on root and starchy crops in general 26, cassava 31, gabi (*Colocasia esculenta*) 15, ginger 12, potato 4, peanut 37, sago (arrowroot) 3, sincamas (*Pachyrrhizus tuberosus*) 5, sweetpotato 25, yam 10, and yautia 2; on fiber plants in general 18, buri (*Corypha elata*) 31, cotton 26, jute 4, kapok 40, and roselle 16; on oil-producing plants in general 38, camphor 3, castor-bean 9, lumbang 33, and sesame 8; on rubber plants in general 68, ceara 3, gutta-percha 9, and para 18; on medicinal plants in general 49, betel 8, chaulmoogra 26, cinchona 8, and datura 6; on spices and condiments in general 3, annatto 4, and pepper 8; and miscellaneous crops including bamboo 23, derris 15, forage 58, nipa 32, and pili 18.

Yarovization of winter barleys, D. N. Borodin (*Amer. Jour. Bot., 21 (1934), No. 10, p. 708*).—Of 50 strains of barleys treated, 7 produced typical yarovization effect or winter type response (full heading in experiment and grass cluster in check), 10 by acceleration of heading and ripening or winter-spring type response, and 2 by slight acceleration of heading or spring-winter type response, while 13 strains did not respond to the treatment used, remained in the grass cluster stage both in experiment and check, and were classed as stubborn winter

type. Nine varieties produced heads in both experiment and check or spring type response. The yarovization effect among barleys seemed to be more diversified than in winter oats (E. S. R., 72, p. 610).

The seedling characters of some cultivated Brassicae, W. S. Robson (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 418–429, pls. 2*).—Detailed study of the morphological characters of seedlings of some cultivated forms of *Brassica* showed no constant points of difference between the seedlings of swede turnips and swede rapes, nor between the seedlings of the bulb-forming turnips and their corresponding leafy turnip rapes.

Adaptation of fertilizers for cotton soils, O. Schreiner and J. J. Skinner (*Amer. Fert., 81 (1934), No. 12, pp. 5–7, 28, 30*).—In this discussion of the adaptations of fertilizer composition and proportions of plant foods to meet the requirements of cotton soils, experiments by the U. S. Department of Agriculture and State experiment stations in the South, sometimes in cooperation, are cited to show that inorganic sources of nitrogen may be as effective for cotton production as higher-priced organic ammoniates, thus effectively reducing the fertilizer cost to the consumer. Delayed nitrogen fertilizer applications appear not to be more efficient than full applications in the fertilizer at planting time, thus providing further economies in farm labor. Properly blended fertilizer salts, together with basic materials in the preparation of concentrated fertilizers, avoiding high acidity equivalents, may be as efficient on cotton soils as ordinary fertilizers, but at a lower cost for equivalent plant food.

Directions for cotton improvement in China, H. H. Love (*China Natl. Agr. Res. Bur. Spec. Pub. 7 (1934), pp. 96, figs. 3*).—Methods of selection and hybridization are outlined, together with methods considered suitable for field testing. The publication is in both English and Chinese.

Deterioration problems in New Zealand Chewings fescue, N. R. Foy (*New Zeal. Jour. Agr., 49 (1934), No. 1, pp. 10–24*).—Deterioration in fescue seed during shipment from New Zealand to England might be attributed to high temperature and humidity during transit, although production factors also appear to influence seed vitality, which in turn controls to some extent the degree of deterioration. Data gained from experimental drying on small-scale shipments under varied conditions in cooperation with the Official Seed Testing Station, Cambridge, England, and the U. S. Department of Agriculture, suggested that seed drying offers the most satisfactory means of overcoming transit deterioration and that seed so treated will retain vitality for at least 6 mo. after delivery. The seed must be kept dry for the period of shipment and storage. Shipment in cold storage also seemed to have possibilities.

The effect of a controlled nitrogen supply with different temperatures and photoperiods upon the development of the potato plant, H. O. Werner (*Nebraska Sta. Res. Bul. 75 (1934), pp. 132, figs. 31*).—The effects of nitrogen supply upon the development and composition of the different parts of the potato plant when grown with various temperatures and photoperiods were studied in plants grown in sand receiving nutrient solutions.

The extent, rate, and place of nitrogen assimilation and carbohydrate synthesis and utilization were greatly altered with different temperatures and photoperiods, and, consequently, the nature and extent of the morphological responses of the plants to changes in the external nitrogen supply were comparably altered. Carbohydrates accumulated (and tubers formed) whenever they were not utilized in formation of new tissues or maintenance of those previously formed (respiration). The plant's inability to use carbohydrates in building new tissues resulted from an inhibition of the assimilation of nitrogen

and occurred at low temperatures or in short days or when nitrogen was withheld from the nutrient solution. Excessive respiration prevented carbohydrate accumulation or created a deficit when the temperature was high, especially with long days.

High temperatures, long days, and an abundant external supply of nitrogen favored vegetative growth (in all parts except tubers), whereas early tuberization was induced with low temperature, short days, or a deficiency of nitrogen. Maximum tuberization occurred with days of intermediate length, low temperature, and abundant nitrogen. Distinctive types of plants with adequate nitrogen are described briefly. When either day length or temperature, or both, was increased vegetative growth resulted, whereas tuber formation occurred as they were decreased. Tubers were produced at temperatures commonly considered too high for tuberization by withholding nitrogen from the nutrient solution, or at even higher temperatures by using a short (10.5-hr.) photoperiod.

The withholding of nitrogen from the nutrient solution when conditions were most favorable for maximum vegetative growth, i. e., long, warm days, resulted in a prompt and extensive decrease in the inorganic nitrogen in the plant, accompanied by retardation of vegetative growth, carbohydrate accumulation (especially starch), and either prompt initiation or acceleration of tuber development. As the nitrogen deficiency was prolonged, accumulated starch disappeared from leaves and stems, leaves became pale, maturity was hastened, and final total weight of tubers was reduced materially. When conditions favored maximum tuber development but were least favorable for vegetative growth, withholding nitrogen did not accelerate tuberization measurably, but it inhibited vegetative growth and lowered final tuber yield. Resupplying nitrogen to nitrogen-starved plants resulted in a rapid increase of inorganic nitrogen in all plant parts, a rapid reestablishment of the chlorophyll supply, and rapid synthesis of nitrogen compounds. With long days vegetative growth was resumed, causing immediate retardation but later acceleration of tuber growth rate, but with short days vegetative growth was not resumed. Under all conditions the life of plants was prolonged and tuber yields were generally increased.

The maximum stolon growth, i. e., long primary stolons and numerous and long lateral and branch stolons, occurred when conditions especially favored vegetative growth. Under optimum conditions for vegetative growth, stolon axes (except those terminated by tubers) continued to be initiated or elongated after tubers had formed on primary stolons, whereas under conditions optimum for tuberization practically all stolon growth ceased when the first tubers developed.

In plants growing rapidly the percentage of dry matter decreased from leaves to petioles, upper and lower stems, and to the stolons, and then increased in the tubers to the highest percentage. The highest percentage in tubers occurred when conditions were very favorable for accumulation of carbohydrates, i. e., short days, low temperatures, and when the nitrogen supply was deficient. Whenever or wherever nitrogen was being assimilated into the plant structure, the percentage of inorganic nitrogen was low. It was lowest in tubers, followed by leaves, and highest in the stems, and was low in all parts when days were long and temperature high, or when nitrogen was withheld from the nutrient solution. The highest percentage of assimilated or organic nitrogen occurred in the leaves, next in the tubers, and lowest in the stems. In young plants most of the assimilated nitrogen (fresh-weight basis) was in the leaves, but as tubers developed a constantly increasing percentage of the assimilated nitrogen in the

plants was found in the tubers. The organic nitrogen in tubers continued to increase till plants were mature. Plants tuberizing rapidly and not producing vegetative portions had only a slightly higher percentage of total hydrolyzable polysaccharides in leaves and tubers than did plants that continued to be distinctly vegetative. Tuber-producing plants generally had a higher percentage of sucrose but a lower reducing-sugar content than the more vegetative plants.

Effect of parboiling rough rice on milling quality, J. W. Jones and J. W. Taylor (*U. S. Dept. Agr. Circ. 340 (1935), pp. 15, figs. 6*).—In experiments in parboiling rice varieties grown on a commercial scale in the United States, the average increase in head rice (whole kernels) in samples soaked 24 hr. at room temperatures and steamed 15 and 25 min. was in Fortuna 10.2 percent, Rexoro 25.4, Edith 21.7, Iola 19.6, and Blue Rose 0.6, and in Colusa and Caloro steamed 45 min., 19.1 and 28 percent, respectively. The highest increase in head rice was 44.2 percent in a sample of Fortuna soaked 25 hr. at room temperature and steamed 45 min., and it was 34.2 percent in a sample of Rexoro soaked 45 hr. at room temperature and steamed 50 min.

The increases in head rice as a result of parboiling were essentially the same regardless of length of soaking period, temperature of the water in which the rice was soaked, or length of the steaming period. The color and texture of the parboiled milled rice were, however, affected by these factors. The average increase in head rice in all Fortuna samples soaked at constant temperatures for various periods and steamed 20 and 35 min. was 29.7 percent and in all Rexoro samples 25.2 percent.

Parboiled milled rice retains its shape better when boiled and when sterilized in containers after being boiled than does untreated rice of the same varieties, and the opinion is expressed that "the consumption of rice in the United States very probably could be materially increased by supplying the market with high-quality parboiled rice, which, according to all the evidence, is better in cooking quality and in flavor."

Effect of variations in stand on yield and quality of sugar beets grown under irrigation, H. E. Brewbaker and G. W. Deming (*Jour. Agr. Res. [U. S.], 50 (1935), No. 3, pp. 195–210, figs. 3*).—Studies conducted near Fort Collins, Colo., in 1930 and 1931 and at Rocky Ford in 1931 by the U. S. D. A. Bureau of Plant Industry, cooperating with the Colorado Experiment Station, were made to determine the response of sugar beets to increased space allotment per plant and the relationship existing between weight and density and uniformity of stand.

The 8 beets adjacent to a single blank space or skip were increased in weight to compensate for 96.2 percent of the loss of a single beet. These and other results indicated an unusual capacity in the sugar beet to utilize additional space allotment when grown under usual field conditions. As the size of beet increased, a slight lowering of quality was shown, both as to percentage of sucrose and apparent coefficient of purity. When doubles existed to the extent of 25 percent of the total number of hills, no loss was apparent in yield or quality. Doubles and triples alternating in the row with the adjacent row consisting of doubles resulted in a significant reduction in yield at Fort Collins but no reduction at Rocky Ford.

The weight of beets was correlated significantly with density of stand, the r values ranging from +0.3454 to +0.7098 for the relationship within blocks. Quality was similarly correlated with stand, although to a much less extent. Regression studies of weight of beets on stand indicated a range of from 0.76 to 2.1 tons of beets per acre for each 10 percent variation in stand.

Yields obtained in a study of width of row (18–24 in.) and spacing (6–16 in.) showed increases of an average of 0.47 ton for the 8- over the 12-in.

spacing, or an increase of 50 percent in number of beets per acre, and 1.39 tons for 8- over 10-in., or 100 percent more beets per acre. Uniformity of space allotment, *i. e.*, the elimination of skips or blank spaces in the stand, appeared to be relatively far more important in determining final yields than the particular width between rows or spacing between beets in the row.

Practical suggestions are made for harvesting experimental plats of sugar beets in order to eliminate the effect of variations in stand.

Tobacco production in Australia (*Aust. Tobacco Invest. Bul. 3 (1932), pp. 81, pl. 1, figs. 11*).—Practical information is given on the history of the crop in Australia and world production; relation of soil and climate to tobacco culture and the soils and climates of Australia tobacco areas; fertilizers; cultural methods; harvesting, curing, grading, and marketing; and diseases and insect pests.

Variation and correlation in grain yield among 1,500 wheat nursery plots, G. A. Wiebe (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 4, pp. 331–357, figs. 7*).—The variation and correlation in grain yield among 1,500 nursery plats of Federation (C. I. No. 4734) wheat—15 ft. long, 12 in. apart, and grouped in 12 series of 125 rows each, and grown at Aberdeen, Idaho, in 1927—are analyzed in this contribution from the U. S. D. A. Bureau of Plant Industry, based on cooperative investigations with the Idaho and California Experiment Stations.

The total variation was observed to tend to increase when more land was added to the total area, provided the size and shape of the ultimate unit remains the same, but when more land was added by increasing the size of the ultimate plat (the number remaining the same), the total variation tended to decrease. When the entire experimental area was used in each study of variation with increasing row lengths, the variation decreased and was found to be a function of n (the number of ultimate plats combined) and r (their intraclass correlation). The correlation of the yields of adjacent rows was found to be high and decreased in a nearly linear relation until the rows were 48 ft. apart, beyond which statistically significant correlations could not be shown.

The intraclass correlation coefficient, calculated according to a formula of Harris (E. S. R., 33, p. 727), increased with decrease in the size of the combination plat compounded by contiguous association, provided the shape remained constant. When the combination plat remained the same in size, the coefficient increased as the shape of plat approached a square. The variation of the ultimate plats (rows) within combination plats, compounded by contiguous association, decreased when the shape was constant but the size decreased, and also when the size was constant but the shape approached a square. The variation within combination plats, compounded by noncontiguous association, approached the total variation. The nearness of approach depends on the intraclass correlation. The variation between combination plats, compounded by contiguous association, increased when their shape was constant but their size decreased, and also when their size was constant but their shape approached a square. The variation between combination plats, compounded by noncontiguous association, decreased as the number of ultimate plats grouped became larger, the reduction being nearly proportional to the square root of n the number of plats grouped. A greater reduction in variation between combination plats was obtained when an equal number of replicates were distributed noncontiguously than when they were distributed contiguously.

The actual and theoretical curves for the variation were shown to agree exactly when the latter is calculated as a function of both n and r. Less bias was obtained in the estimate of the experimental error when the replicates were distributed completely at random as contrasted with systematic distributions. When the varieties of each replication were arranged according to the principle of maximum contiguity the experimental error was reduced.

Two systems, involving the principle of maximum contiguity, are suggested as plat arrangements for nursery practice, when the number of varieties to be tested is large.

Longevity of crop seeds, II, K. M. SONAVNE (*Agr. and Livestock in India, 4 (1934), No. 3, pp. 287–292, figs. 2*).—Continued longevity studies (E. S. R., 60, p. 228) reached the twelfth year in 1933. The number of years after which germination fell below 60 percent and when it failed entirely were, respectively, for pearl millet 5 and 9, sorghum 7 and 10, common wheat 6 and 10, corn 6 and 8, pigeonpeas 8 and 11, *Dolichos biflorus* 7 and 10, Kabuli gram 7 and 9, cotton (*Gossypium neglectum*) —60 percent in 1 and 8, peanuts 3 and 7, safflower 7 and 8, sesamum 6 and 8, and flax 8 and 10. Several species of *Phaseolus* and Deshi gram persisted with high germination percentages and retained a certain percentage even after 12 yr. Other tests begun in 1925 and 1926 showed that rice could be stored safely for 4 yr. without much loss of its germinating capacity and that *Capsicum annuum* and *Setaria italica* germinate well up to 4 or 5 yr., while alfalfa gave good germination for 7 yr.

Commercial agricultural seeds, 1934, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp. 154 (1934), pp. 109–131*).—The germination, purity, weed seed content, and in the case of legumes the hard seed percentage are tabulated for 128 samples of agricultural seed collected from dealers in Maine in 1934.

Seed inspection, F. A. MCLAUGHLIN (*Massachusetts Sta. Control Ser. Bul. 77 (1935), pp. 66*).—The germination, purity, and weed seed contents are tabulated for 211 official samples of field crop seed and 521 of vegetable seed collected in Massachusetts during the year ended October 1, 1934. Samples of sweet corn, beans, beets, carrots, cucumbers, lettuce, onions, parsnips, radish, rutabaga, spinach, squash, and turnips were tested for trueness to type and variety. The kinds of disease organisms that occur in commercial lots of sweet corn and the effects of such organisms and of seed treatment upon germination were also studied.

HORTICULTURE

Fertilizers for vegetable crops, R. A. SCHROEDER and H. G. SWARTWOUT (*Missouri Sta. Circ. 185 (1935), pp. 4*).—Information is presented on the fertilizing of potatoes, tomatoes, leafy vegetables, cucurbits, root crops, onions, sweetpotatoes, eggplant and peppers, sweet corn, and asparagus and rhubarb

Composition of the developing asparagus shoot in relation to its use as a food product and as material for canning, C. W. CULPEPPER and H. H. MOON (*U. S. Dept. Agr., Tech. Bul. 462 (1935), pp. 24, figs. 8*).—Analyses of shoots collected during the period April 20 to June 14 from an 8-year-old asparagus bed at Arlington Experiment Farm, Va., showed a slight but significant tendency for total solids, including both the soluble and insoluble fractions, total sugars, and total nitrogen to decrease as the season advanced, with the result that the final sample was very definitely lower in amounts of all these constituents. However, the quality of the canned and the freshly cooked product of shoots 4 in. in length did not vary greatly at the time of cutting. Moisture content varied continuously from the base to the tip of the shoots at all stages of development. Sugar content was greatest at the base and decreased toward the tips in stalks at all stages of growth. Total nitrogen was highest in the tip and decreased progressively toward the base. Pressure readings showed the greatest resistance at the base of the stalks. Resistance at the tip varied little in stalks of different lengths, but at the base the changes were great as the result of fiber development. In concluding, the authors point out that the results are based largely on a single season's work in a single locality and that

different environments and culture might introduce new elements into the situation.

Dominance of certain quality characters in cabbage, O. H. PEARSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 169–176, figs. 4*).—Observations at the California Experiment Station upon selfed lines of Copenhagen Market cabbage and various crosses between such lines showed that head weight may be affected adversely by inbreeding, but not always, however, to an important degree. Combinations of pure lines sometimes resulted in marked heterosis, but in other cases, especially where one parent had lost but little vigor in inbreeding, the progenies were the same size as the larger parent. Head shape was apparently controlled by multiple factors, with no definite dominance. Crosses between elongated and flat-headed lines were intermediate in shape. One group of crosses produced flatter heads than either parent, suggesting that certain head factors are complementary. No dominance was shown with respect to the penetration of the core. With 17 as the usual number of outer leaves, there were observed strains with 25 leaves. The fewer-leaved condition was generally dominant.

Lima beans (*Alabama Sta. Leaflet 14 (1935), pp. 4*).—Varieties, soil and culture, fertilizers, harvesting, and insect and disease control are discussed.

Effect of a localized photoperiod on spinach, J. E. KNOTT (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 152–154*).—Extension or limitation of the photoperiod when restricted to the flower bud of spinach plants was found by the [New York] Cornell Experiment Station to have little influence on the formation of seed stalks. The author concludes that, although the response of the plant may be localized in the bud, the leaves appear to function in some way to hasten the reproductive response to the appropriate photoperiod, possibly in the case of the spinach by producing some substance, or stimulus, which is imparted to the growing point. Even when the temperature was very favorable to seed stalk formation, spinach plants restricted to a 10-hr. day and those in which the flower bud alone received 15 hr. of light showed no sign of seed stalk formation.

Nematode resistance of certain deciduous fruit tree seedlings, W. P. TUFTS and L. H. DAY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 75–82, figs. 2*).—A record is presented of the results of tests of a large number of peach, nectarine, apricot, plum, cherry, pear, quince, apple, walnut, and almond seedlings of known ovule parentage on a soil at Delhi, Calif., presumably heavy and uniformly infested with a nematode (*Heterodera marioni*).

Bulk fruit thinning and wide spacing of Newtown apples, G. G. BROWN (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 49–52*).—A comparison by the Oregon Experiment Station of three types of fruit thinning, (1) in which all fruits were removed from 4 of 8 sections of the tree, (2) uniform thinning to 10 to 12 in., and (3) uniform thinning to 5 to 6 in., showed the largest economic returns the current season from the third treatment, due to the larger number of (though smaller) fruits. The larger size of the apples from treatment 1 than from treatment 3 is attributed to a cross movement of nutrients from the completely defruited to the bearing sections. Studies of blooming behavior the succeeding spring revealed 22.6 and 2.2 percent of blossoming spurs on the completely defruited and lightly thinned portions of tree 1, 24.5 percent in tree 2, and 1.6 percent in tree 3.

Apple growing in New York, G. H. HOWE (*New York State Sta. Circ. 158 (1935), pp. 16, fig. 1*).—In this circular there is presented information relating to climate, soils, sites, propagation, planting, culture, pruning, pollination, handling the crop, spray schedules, and varieties.

Effect of leaf-fruit ratio and available soil moisture in heavy clay soil upon amount of bloom of pear trees, W. W. ALDRICH and R. A. WORK (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 57–74, figs. 8*).—Observations at Medford, Oreg., on the blossoming of Anjou, Bartlett, and Beurre Bosc pear branches ringed and so adjusted by leaf and fruit thinning as to leave 100 and 10 leaves per fruit indicated that the period in which fruit-bud formation can be influenced by leaf adjustments ends about August 1 in Anjou and Bartlett and about August 16 in Bosc. The quantitative effect of the leaf adjustment on flower-bud formation varied directly with the time of treatment. The beginning of the period for Bartlett when defoliation failed to inhibit nearly all fruit-bud formation was on July 1. Fruit thinning of entire trees within 60 days after the beginning of full bloom resulted in increased amounts of bloom the succeeding year. During the period when fruit-bud formation could be influenced, the reduction of available soil moisture to the point where fruit growth rate was reduced resulted in increased flower-bud formation the following spring.

Soil moisture requirements of pear trees, R. A. WORK (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 25–29*).—In this general discussion of factors affecting the water requirements of pear trees, the author states that experiments at Medford, Oreg., showed that removing a portion of the roots of pear trees caused a slowing down in the rate of fruit growth. On the other hand, when 20 percent of the transpiring leaf surface was removed and the leaf-fruit ratio was the same in all trees, the rate of fruit enlargement was greater than in the check or root-pruned trees. There was no indication that the removal of 20 percent of the root system caused the remaining roots to extract moisture more rapidly. Mature pear trees growing in soils up to 5 or 6 ft. deep were found to have more roots in the upper foot than at any other level. In orchards of mature trees roots were found to be distributed throughout the entire available area of the orchard.

Some factors affecting profitable production of Anjou pears, W. W. ALDRICH (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 38–41*).—At Medford, Oreg., Anjou pear trees with 35 leaves per fruit produced 10.7 lugs of fruit as compared with 9.1 lugs for trees thinned to 50 leaves per fruit. During hot weather trees in heavy soils appeared better able to supply moisture to the leaves when there was a large supply of available water in the soil than when the water was approaching the permanent wilting point.

Pear growing in the Pacific Coast States, C. F. KINMAN and J. R. MAGNESS (*U. S. Dept. Agr., Farmers' Bul. 1739 (1935), pp. II+41, figs. 18*).—A general account is given of climatic requirements, geographic distribution, propagation, culture, fertilizers, pruning, harvesting, storage, control of insects and diseases, varieties, and the general outlook for the industry.

Growth of the embryo, seed, and pericarp of the sour cherry (Prunus cerasus) in relation to season of fruit ripening, H. B. TUKEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 125–144, figs. 6*).—Observations at the New York State Experiment Station on the developing fruits of Early Richmond, Montmorency, and English Morello cherries showed a growth behavior similar to that observed previously in the peach, apricot, plum, and sweet cherry. There were three stages of pericarp development, (1) rapid increase following fertilization, (2) delayed growth during midseason, and (3) a rapid final increase. Regardless of differences in time of ripening of the three cherries, the duration of the first stage was practically identical. Ripening dates of the three varieties were correlated apparently with the duration of the second stage, lasting 3 to 5, 10 to 12, and 24 to 28 days in the three varieties, respec-

tively. Pit hardening began about the same time in all three cherries and proceeded rapidly. The embryos were arrested in development until 20 to 22 days after full bloom and then grew rapidly to reach a maximum size in 18 to 25 days. As in the sweet cherry and peach, the embryos of the early variety failed to develop fully. Nucellus and integument development followed the first period of rapid fruit increase, and the correlation of the growth of the embryo, nucellus, and integuments was similar to that reported for the peach (E. S. R., 72, p. 621). Actual volume increase in all three cherries was approximately 100 percent for each day between the fourth and eighth following full bloom. During the final stage of rapid increase Montmorency gained 198 percent in volume in 9 days and English Morello 240 percent in 10 days.

Cold storage experiments with cherries [trans. title], H. Kessler (*Landw. Jahrb. Schweiz, 49 (1935), No. 1, pp. 87–100; Fr. abs., pp. 99, 100*).—Studies at Wädenswil, Switzerland, with 23 varieties indicated that a temperature range of 2° to 0° C., accompanied by a relative humidity of from 85 to 90 percent and a daily change of air, offers the most favorable environment for storing cherries. Contrary to observations on apples, cherries held at 0° did not develop any physiological disorders. Mildew was reduced as 0° was approached. Certain varieties lost their flavor rapidly, making regular flavor tests imperative. The duration of the storage period was materially prolonged by harvesting before the fruits had reached their fullest maturity. The period that cherries could be held successfully was limited, being only from 8 to 10 days for most varieties.

Comparative study of the developing and aborting fruits of Prunus persica, T. J. Harrold (*Bot. Gaz., 96 (1935), No. 3, pp. 505–520, figs. 27*).—A microscopic study of Carman peach fruits collected in the University of Georgia orchards at various stages of development from before full bloom until within 3 weeks of maturity indicated that the only apparent difference between dropping and developing fruits was simply that growth had ceased in one instance and continued in the other. Three distinct waves of dropping were noted, (1) the buds which fell before, during, and after full bloom; (2) fruits of 8 to 14 mm in length, dropping about the fifth week after bloom; and (3) fruits about 25 to 30 mm in length, abscissing about the seventh week.

In general, the development of the megagametophyte and fruit of the peach agreed with observations by other workers on other species of *Prunus*. The possibility is suggested that a disorder in the region of the chalaza may occur prior to cessation of development of the gametophyte or of the embryo, resulting in degeneration of the seed and fruit.

Winter desiccation in the Latham raspberry, W. G. Brierley (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 110–113*).—Mature canes cut in November and suspended out of doors, after sealing the basal ends with grafting wax, were found to lose weight consistently. When brought into the greenhouse, the cut canes developed leaves but lacked the bright color of normal canes. Dry weight determinations of samples of the excised and normal canes showed sharp moisture losses in both, with considerably larger decreases in the former, suggesting that in the field the canes are apparently able to transport water upward during mild weather to replace that lost by evaporation. The author considers it likely that winter injury in hardy varieties of red raspberries is often associated with drying. Apparently Latham canes may suffer whenever the moisture content falls below 50 percent of the dry weight.

Winter killing of the roots of the Beta grape, W. G. Brierley and E. Angelo (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 114–118*).—Observations on rooted cuttings exposed to low temperature in controlled storage chambers

and also to winter temperatures out of doors showed that the roots of the Beta grape are severely injured or killed at temperatures of about −12° C. (10.4° F.). Out doors the most severe injury occurred at the 3-in. soil depth, with less damage as the depth increased. The wood and callus growth apparently withstood lower temperatures than did the roots. Vines produced from single-eye cuttings were lacking in vigor, and because of their nearness to the surface the roots were in a more hazardous position.

Increase in berry size in the grape, J. R. van Haarlem (*Canad. Hort. and Home Mag., 58 (1935), No. 5, pp. 121, 122, figs. 3*).—Determinations at the Vineland, Ont., Horticultural Experiment Station by the water displacement method of the volume increase in tagged clusters of Concord and Niagara grapes showed no falling off in the rate of growth of the berries of either variety up to 3 weeks before harvest. At this time there occurred a slight decline in Concord and a more marked decline in Niagara. After this stage weight increases were again very rapid for another week, falling off again at harvest time. The first decline is believed to be associated with the ripening of the seed, and the second or final decline with a final water loss in the pulp caused by a concentration of the sugar and acid.

Directions for spraying fruits in Illinois (*Illinois Sta. Circ. 429 (1935), pp. 24, figs. 3*).—This paper is presented in four parts: I, Some General Facts About Insects, Diseases, and Spraying; II, Spray Schedules [Apples, Pears, Peaches, Cherries, Plums, Brambles, Currants and Gooseberries, Grapes, and Strawberries]; III, Preparing and Mixing Spray Materials; and IV, Commercial Preparations.

Insecticides and fungicides, 1934, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 154 (1934), pp. 132–136*).—The results are given of analyses of 49 samples collected and examined in 1934.

Some phases in the water relation of citrus, F. F. Halma (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 108, 109, figs. 2*).—Studies at the Citrus Experiment Station, Riverside, Calif., of the relation between the weekly increments in fruit size and the average percentage of moisture in the soil showed a definite positive correlation between the two. The relative saturation deficit of leaves collected at 10:30 a. m. and 1:30 p. m. showed an inverse relationship between deficit and soil moisture. It was evident that the water balance in the tree becomes increasingly disturbed as soil dries progressively from the top downward.

Growth response of tree tops relative to soil treatments, A. R. C. Haas (*Calif. Citrogr., 20 (1934), No. 2, p. 36, fig. 1*).—In support of the contention that trees which have been unhealthy for a period of years cannot always be restored to a vigorous condition by soil management, the author asserts that the application over a period of years of 15 lb. of nitrate of lime, together with nitric acid in basins at each irrigation, failed to restore mottled-leaf Valencia orange trees. At the same time young trees planted in the same basins developed rapidly and kept healthy. The author suggests that the root system of the older trees may have been in such poor condition as not to be able to benefit from the improved culture.

Influence of rootstock strains on yield and size of lemon trees, H. J. Webber (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 83–88*).—Records taken by the Citrus Experiment Station, Riverside, Calif., on the yield and growth of Eureka and Lisbon lemon trees grown from buds taken from single trees and worked on seedlings of uniform genetic identity showed a very clear effect of the stock on the scion. In general the sweet orange stocks were outstanding in value, and since records taken at two rather widely separated points, River-

side and Sespe, showed the same varieties to be of high value, genetic origin rather than environment is considered the important determining factor. Added to the fact that many of the old lemon groves of the State are on sweet orange roots, the evidence strongly suggests the high value of sweet orange understocks for lemons. In general there was a strong correlation between the effect of the stocks on yield and their effect on growth. Since certain stocks within a species were of particular value, this is considered evidence that certain definite stock and scion combinations are desirable.

Preliminary report of soil moisture conditions in western Oregon nut orchards, C. E. Schuster (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 41–44*).—Noting a close correlation between the closing of the stomata and the decreasing soil moisture supply, studies were made in various nut orchards to determine the permanent wilting point of the soil at different levels. There was found a great variation with respect to the amount of available water. Certain orchards had as little as 10 in. of available moisture in the upper 6 ft., while others had as much as 20 in. In one case an impervious layer 44 to 48 in. below the surface sharply limited the available moisture supply in midseason, and part of the trees were removed in an effort to improve the situation.

A physiological study of seasonal changes in the composition of the pecan during fruit development, C. J. B. Thor and C. L. Smith (*Jour. Agr. Res. [U. S.], 50 (1935), No. 2, pp. 97–121, figs. 14*).—Analyses of Burkett and Stuart pecan nuts collected near Austin, Tex., at intervals throughout the growing period indicated that development occurs in two more or less distinct periods, (1) from blossoming until the kernel begins to fill, and (2) during the process of filling and ripening. The behavior of the two varieties was nearly identical. The first period of growth was characterized chiefly by the formation of the structural elements of the shuck and the shell. Most of the oil, protein, mineral, and acid-hydrolyzable constituents of the kernel developed during September, and it was evident that practically all of the material from which oil is formed was brought into the fruit from other parts of the tree at the time of oil formation. The same situation is believed to exist with regard to protein. Sugar, almost exclusively of nonreducing form, appeared during the first half of October and is believed to be translocated from the shuck during the later stages of maturity. Since sugar contributes to quality and flavor, early harvesting before the nuts are ready to fall from the shucks is deemed inadvisable. In the locality of the study the critical period in filling pecan nuts was apparently during September.

Causes of decadence in the old groves of North Dakota, H. F. Scholz (*U. S. Dept. Agr. Circ. 344 (1935), pp. 38, figs. 10*).—High mortality observed in 447 groves ranging from 15 to 40 yr. of age is ascribed in part to the use of species not well adapted to dry sites. The greatest losses during the 7 or 8 yr. preceding 1931 were as follows: Carolina poplar 95 percent, willows 49 percent, boxelder and cottonwood 38 percent, green ash 15 percent, and aspen 12 percent. A superabundance of lime, leading to the formation of a partial hardpan relatively near the surface, accentuated injury in many cases. Wide spacing, by encouraging grasses and wind erosion, is characterized as undesirable. Grazing and burning over the surface were also harmful factors. The natural short life of certain species, with a consequent susceptibility to disease, contributed to unfavorable results. Among broadleaf species, green ash on well-drained soils and aspen, boxelder, and native cottonwoods on lowlands are recommended for planting. Other hardwoods, such as hackberry, white ash, American and Chinese elms, bur oak, and Russian olive, are deemed promising. Among worth-while conifers are listed Rocky Mountain red cedar, Rocky Mountain ponderosa pine, and some forms of Scotch pine. In moister locations

blue spruce, western white spruce, and possibly some forms of Siberian and Korean larches are considered promising. Belts of trees at least 5 rods wide and bordered by low-growing, bushy species are suggested as more desirable than solid blocks or narrow rows.

The tung-oil tree in Texas, P. R. JOHNSON and S. H. YARNELL (*Texas Sta. Circ. 75* (*1935*), *pp. 16, figs. 8*).—Included in this circular of general information are data on temperature requirements, survival of trees at temperatures near 0° F., size and weight of seeds, oil content of seeds, and yields.

FORESTRY

Ecological problems of the humus layer in the forest, L. G. ROMELL (*[New York] Cornell Sta. Mem. 170* (*1935*), *pp. 28, pl. 1*).—Of the two principal types of humus layer, namely, mull and mor, the former is said to be ecologically richer and to be characteristic of forests consisting mostly of broad-leaved species. In New York State mull and mor may alternate very locally, due to drainage conditions, differences in stand, exposure, and geology. Oxidation-reduction potential readings on the best types of mull and on the heaviest and most typical hemlock mor showed that mull suspensions were rather strongly reducing, while those of mor were the opposite. Nitrification was not found to be restricted closely to mull but to occur frequently in light forms of mor. Clear average differences in ecological environment for mull and mor were shown both in acidity and in nitrogen mobilization. Important structural differences between the two humus layers lay in an abundance of fungus mycelia, many belonging to the mycorrhizas, in the mor, whereas in pronounced mull bacteria appeared very largely or almost entirely to replace the fungi. In the more acid mors most or all of the nitrogen-fixing organisms are apparently excluded. The activation of mor-type soils following burning or cuttings is believed to be associated with the killing of the roots and their mycorrhizas. This resulted both in a green manuring effect and in a change in competitive conditions. The green manuring not only furnished raw materials but favored a better, more bacterial, mull-like type of decomposition. In concluding the discussion, which supplements an article noted previously (E. S. R., 68, p. 299), the author discusses the silvical application of the biological theory.

The black locust in Alabama, L. M. WARE (*Alabama Sta. Circ. 73* (*1935*), *pp. 15, figs. 6*).—Experimental plantings established at various points indicated that black locust will not succeed when planted in gullies, on eroded hillsides, or in old fields where the soil has not been prepared or fertilized. On the other hand plantings in old fields made very rapid growth when the soil was properly tilled and fertilized. Moderate pruning with a view to the development of a dominant leader was found helpful. The costs of establishment were such as to raise doubt as to the use of locust in control operations but did not preclude its use in fence-post production. An intercrop of cotton during the early stages is suggested as a means of defraying the costs.

Ohio Forest News, [April 1935] (*Ohio Forest News [Ohio Sta.], No. 25* (*1935*), *pp. 8, figs. 2*).—Included are brief popular articles relating to survival in plantations of white, Corsican, Scotch, and Austrian pines; expansion of publicly owned forest areas; winter injury to Ohio trees; shelterbelt plantings, etc.

DISEASES OF PLANTS

[Papers presented at the twenty-sixth annual meeting of the American Phytopathological Society, Pittsburgh, Pa., December 27–29, 1934] (*Phytopathology, 25* (*1935*), *No. 1, pp. 1–40*).—Abstracts of the following papers are

given: Hybridization Between *Ustilago hordei* and *U. medians*, by C. C. Allison (p. 5); Black Stele Root Rot of Strawberry, by H. W. Anderson (p. 5); *Phytophthora* Trunk Canker of Apple, by R. C. Bains (p. 5); Importance of Sanitation in Controlling Crown Gall of the Red Raspberry, by W. M. Banfield and E. C. Mandenberg (pp. 5, 6); Tobacco Wildfire Control in Pennsylvania, by W. S. Beach (p. 6); A Mosaic on Cabbage in Wisconsin, by L. M. Blank (p. 6); Pathogenicity and Physiology of *Pseudopeziza ribis*, by E. C. Blodgett (pp. 6, 7); Evidence of the Seed-borne Nature of Late Blight (*Phytophthora infestans*) of Tomatoes, by O. C. Boyd (p. 7); Microorganisms Infecting Pines Attacked by *Dendroctonus frontalis*, by W. C. Bramble and E. C. Holst (p. 7); Streak, A Virus Disease of Roses (pp. 7, 8) and Symptoms of Rose Mosaic (p. 8), both by P. Brierley; Heterothallism in *Peronospora parasitica*, by H. L. G. de Bruyn (p. 8); Damping Off of Alfalfa on Acid and Neutral Iowa Soils, by W. F. Buchholtz (pp. 8, 9); Six Microorganisms Pathogenic on Cactus, by A. Buzzati-Traverso (p. 9); Growth Association of Microorganisms, by J. C. Carter (p. 9); Mechanical Transmission of Two Viruses to Pineapple, and The Symbionts of *Pseudococcus brevipes* in Relation to a Phytotoxic Secretion of the Insect, both by W. Carter (p. 10); Serological Evidence in the Study of the Relationships of Certain Plant Viruses, by K. S. Chester (p. 10); The Development of Root-Knot Nematode Galls, by J. R. Christie (pp. 10, 11); A New and Important Factor in the Epidemiology of Tobacco Leaf Diseases, by E. E. Clayton (p. 11); Biochemic Studies on the Metabolism of Crown-Gall and Hairy-Root Bacteria and on the Composition of Crown Galls, by H. A. Conner, A. J. Riker, and W. H. Peterson (p. 11); Occurrence of Oospores of *Peronospora effusa* with Commercial Spinach Seed, by H. T. Cook (pp. 11, 12); Spinach Seed Treatments in Virginia, by H. T. Cook and J. A. Callenbach (p. 12); Relation of Insect Injuries and Root Diseases in Sugar Cane, by M. T. Cook (p. 12); Relation of Host Vigor to Apple Infection with *Xylaria mali*, by J. S. Cooley (pp. 12, 13); Influence of Preceding Crops on Damping Off of Sugar Beets, by G. H. Coons and J. E. Kotila (p. 13); Some Ecologic Relations of *Phytophthora infestans*, by W. Crosier and D. Reddick (p. 13); Scab Resistance in Potato Seedlings, by H. M. Darling, J. G. Leach, and F. A. Krantz (pp. 13, 14); Mycorrhizal and Pseudomycorrhizal Infections of Pine Roots During First Year's Growth, by K. D. Doak and P. L. Fisher (p. 14); A *Pythium* Species of the Megalacanthum Type in Cineraria Roots and the Relation of Putrefaction to Parasitism Among the Pythiacene (p. 14) and Occurrence of a Species of *Aphanomyces* on Roots of Spinach and Flax (pp. 14, 15), both by C. Drechsler; Thermal Inactivation of Some Tobacco Viruses; Standardization, Technique, and Illustrative Data, by B. M. Duggar (p. 15); Some Factors Affecting "Longevity" in Vitro of Viruses of Tobacco Mosaic and of Tobacco Ring Spot, by B. M. Duggar and D. F. McAlister (p. 15); Sand Culture of Seedlings as a Damping-off Control, by A. A. Dunlap (p. 15); A Neglected Factor in the Planning and Interpretation of Fungicidal Tests, by H. W. Dye (pp. 15, 16); Soil Treatment with Sulphur and Limestone for Control of Bacterial Wilt of Potatoes, by A. H. Eddins (p. 16); Field Trials of Pentachlorethane, Tetrachlorethane, and Xylol as Affecting *Phymatotrichum* Root Rot and Host Plants, by W. N. Ezekiel and J. J. Taubenhaus (p. 16); Infection of Apple Leaves by *Physalospora cydoniae*, by H. H. Foster (pp. 16, 17); Spotted Wilt of Truck Crops and Ornamental Plants, by M. W. Gardner, C. M. Tomkins, and O. C. Whipple (p. 17); Availability of Copper in Bordeaux Mixture Residues and Its Absorption by Conidia of *Sclerotinia fructicola*, by M. C. Goldsworthy and E. L. Green (p. 17); Control of Aster Leaf Rust, by C. E. F. Guterman (pp. 17, 18); A Liquid Formaldehyde Treatment to Control

Damping Off of Flower Seedlings, by C. E. F. Guterman and L. M. Massey (p. 18); The Effect of Mosaic on Transpiration of the Bean, by A. L. Harrison (p. 18); Vascular Disease in Poplar and Willow, by C. Hartley and B. S. Crandall (pp. 18, 19); Control of Downy Mildew of Tobacco, by R. G. Henderson (p. 19); Studies on the Soft Rot and Colon-Typhoid-Dysentery Groups of Bacteria—I, Pathogenicity, by W. D. Henry (p. 19); Apothecium Production in *Sclerotinia trifoliorum* and *S. sclerotiorum*, by L. Henson (pp. 19, 20); Longevity of the Fire-blight Organism in the Honeybee Environment, by E. M. Hildebrand (p. 20); Modes of Entry of *Erwinia amylovora* into the Flowers of the Principal Pome Fruits, by E. M. Hildebrand and L. H. MacDaniels (p. 20); Some Fungicidal Possibilities of Red Copper Oxide, by J. G. Horsfall and J. M. Hamilton (p. 21); Inoculation Tests with *Phytomonas stewarti* and *P. vascularum*, by S. S. Ivanoff (p. 21); Resistance of Sweet Corn to Bacterial Wilt, by S. S. Ivanoff and A. J. Riker (pp. 21, 22); A *Phytophthora* Root and Collar Rot of *Pinus resinosa* Seedlings, by L. W. R. Jackson and B. S. Crandall (p. 22); A New Disease Affecting *Platanus orientalis* in the Eastern United States, by L. W. R. Jackson and B. Sleeth (p. 22); The Value of Zinc Sulphate as a Peach Spray Ingredient, by K. J. Kadow and H. W. Anderson (pp. 22, 23); The Production of Asexual Spores by *Pleurotus corticatus*, by F. Kaufert (p 23); Progress in the Development of Eradicant Fungicides, by G. W. Keitt (p. 23); Fungicidal Properties of Certain Copper-Lime-Arsenite Preparations, by G. W. Keitt and D. H. Palmiter (pp. 23, 24); Pathologic Significance of Seed-Coat Injury in Dent Corn, by B. Koehler (p. 24); Heat Treatment for the Cure of Yellows and Rosette of Peach, by L. O. Kunkel (p. 24); A *Phytophthora* Wilt of Black-Locust Seedlings, by E. B. Lambert and B. S. Crandall (pp. 24, 25); Resistance to *Fusarium* Wilt in Muskmelon, by J. G. Leach and T. M. Currence (p. 25); Uniform Rust Nurseries Indicate Decreasing Severity of Stem Rust, by M. N. Levine and E. C. Stakman (p. 25); Cripple and Dark Stripe of Pineapples in Hawaii, by M. B. Linford (pp. 25, 26); Relation of Carbohydrate-Nitrogen Nutrition to Disposition of Apple to Infection by *Erwinia amylovora* and Suitability of the Chicago Soil-Nutrient Temperature Tank for Phytopathologic Studies, both by G. K. K. Link (p. 26); Variability of Monosporic Cultures of *Coccomyces hiemalis*, by R. O. Magie (pp. 26, 27); Microorganisms in the Atmosphere of Arctic Regions, by F. C. Meier (p. 27); Evidence of the Overwintering of *Plasmopara australis* in Fruits of *Sicyos angulatus*, by I. E. Melhus and G. C. Kent (p. 27); An Albino Strain of Barley Smut (pp. 27, 28) and The Distribution of Intermediate Types of Barley Smuts (p. 28), both by M. B. Moore and C. C. Allison; Effect of Crown Rust on the Cold Resistance of Oats (p. 28) and Effect of Crown Rust on Yield, Water Economy, and Composition of Oats (pp. 28, 29), both by H. C. Murphy; Three Forms of the *Fusarium* Wilt of Celery and Taxonomy of the Fusaria that Cause Celery Wilt (Yellows), both by R. Nelson and L. C. Cochran (p. 29); A Study of Electric Soil Sterilization, by A. G. Newhall (pp. 29, 30); A Study of the Carotenoid Pigments of Urediospores of Wheat Stem Rust and Four of Its Color Variants, by M. Newton, H. Johannson, and T. Johnson (p. 30); A Cytological Study of the Resistance of Apple Varieties to *Gymnosporangium juniperi virginianae*, by C. J. Nusbaum (p. 30); Dissociation of *Fusarium niveum* in Soil, by C. R. Orton (pp. 30, 31); Incubation of the Virus of Pea Mosaic in the Aphid, *Macrosiphum gei*, by H. T. Osborn (p. 31); Physiologic Studies of Several Pathogenic Bacteria that Induce Cell Stimulation in Plants, by J. A. Pinckard (p. 31); An Improved Method for Inducing Spore Fructification in Certain Species of *Macrosporium*, by P. P. Pirone (pp. 31, 32); Bacterial Wilt of Corn and Its Insect Vectors, by F. W. Poos and C. Elliott (p. 32);

Some Environmental Factors Influencing the Development of Apple Hairy-Root and of *Phytomonas rhizogenes*, by A. J. Riker, D. H. Palmiter, and E. M. Hildebrand (p. 32); Copper Phosphate Mixture: A Promising Fungicide, by J. W. Roberts, L. Pierce, M. A. Smith, J. C. Dunegan, E. L. Green, and M. C. Goldsworthy (pp. 32, 33); The Effect of Proteoclastic Enzymes on Purified Preparations of Tobacco Mosaic Virus, by A. F. Ross (p. 33); Chemical Splitting of the Tomato "Combination-Streak" Virus Complex, by M. Shapovalov (p. 33); Influence of Nutrition on Host Susceptibility to Yellow Tobacco Mosaic, by E. L. Spencer (pp. 33, 34); Population Trends of Physiologic Forms of *Puccinia graminis tritici*, 1930 to 1934, by E. C. Stakman, L. Hines, R. C. Cassell, and M. N. Levine (p. 34); Experiments on Physiologic Specialization and Nature of Variation in *Ustilago zeae*, by E. C. Stakman, L. J. Tyler, G. E. Hafstad, and E. G. Sharvelle (p. 34); Studies on the Soft-Rot and Colon-Typhoid-Dysentery Groups of Bacteria—II, Physiology, by A. R. Stanley (pp. 34, 35); A Method of Determining the Rate of Decay in Wood, by F. H. Steinmetz and M. T. Hilborn (p. 35); Further Evidence of the Seed-Borne Nature of *Peronospora destructor*, by W. W. Stuart and A. G. Newhall (p. 35); Laboratory and Field Studies on Sulphur as a Fungicide, by J. J. Taubenhaus and P. Decker (pp. 35, 36); Further Studies on the Longevity of Sclerotia of *Phymatotrichum omnivorum*, by J. J. Taubenhaus and W. N. Ezekiel (p. 36); Particle Size of Three Strains of Tobacco-Mosaic Virus, by H. H. Thornberry (p. 36); Fasciation of Sweet Peas: A Bacterial Disease, by P. E. Tilford (p. 36); Severe Type of Mosaic on a Sugar-Cane Variety, by E. C. Tims (pp. 36, 37); Do Tobacco Plants Recover and Develop an Immunity from Ring Spot? and The Resistance of Ambalema Tobacco to Different Viruses, both by W. D. Valleau (p. 37); Technique Advantageous for the Isolation of *Ceratostomella ulmi* from Bark Beetles, by J. M. Walter (pp. 37, 38); An Aerial *Rhizoctonia* on Beans, by G. F. Weber (p. 38); A Fungus Spot of Azalea Flowers, by F. Weiss (p. 38); Bottom Rot of Calla Rhizomes, by F. Weiss and T. B. Post (pp. 38, 39); Serically Active (Haptenic) Carbohydrates of Genotypes of *Neurospora tetrasperma* and *N. sitophila*, by H. W. Wilcox and G. K. K. Link (p. 39); Host-Parasite Relationship in Bean Rust, by S. A. Wingard (p. 39); *Sclerotinia* Rot of Pumpkin and Squash (pp. 39, 40) and A New Variety of *Tilletia tritici* in Montana (p. 40), both by P. A. Young; and Insoluble Copper Compounds as Substitutes for Bordeaux, by H. C. Young and J. R. Beckenbach (p. 40).

Report of the work of the phytopathological service in the year 1933 [trans. title], N. VAN POETEREN (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 76 (1934), pp. 114, pls. 3, figs. 3*).—Notes are given on diseases of economic and ornamental plants, trees, and shrubs observed or reported during the year in the Netherlands. Briefly reported are the results of investigations on the danger of cattle poisoning in orchards sprayed with bordeaux mixture, on the potato late blight situation in 1933, on primary infections and preventive spraying for apple and pear scab, and on the winter spraying of fruit trees.

The results of fungicide and insecticide testing are reported, and also the work of the plant inspection service. In addition, the entomological and ornithological work of the service is presented.

Biochemical factors involved in local immunity in plants [trans. title], J. DUFRÉNOY (*10. Cong. Internatl. Hort., Paris, 1932, Compt. Rend., pp. 94–132, figs. 8*).—The author here discusses the cellular and cytologic reaction of the host plants to such parasites as *Puccinia asphodeli*, *Uromyces caladii*, *P. sorghi*, *Synchytrium endobioticum*, *P. maydis*, *Peronospora schleideni*, *Phytophthora*

infestans, Pythium ultimum, Colletotrichum gloeosporioides, Verticillium albo-atrum, Gibberella saubinetii; the influence of nutrition on the degree of resistance; and the different forms of immunity.

Haustoria of parasitic fungi, entering living cells of susceptible hosts, cause the cytoplasmic layer first to invaginate into the central vacuole of the cell, then to assume a honeycombed appearance, through the portioning of the originally single or few large vacuoles into a number of smaller ones, resulting in an extension of the cytoplasm-vacuole interphase.

The mere vicinity of hyphae of pathogenic fungi causes the cells of resistant plants to form phenolic (tannin) compounds. These accumulate in the vacuolar sap, which becomes easily flocculated by electrolytes, yielding "vacuolar inclusions."

The same pathogen (*S. endobioticum*) causes warty embryonic outgrowth in susceptible varieties of potatoes, the tissues form little or no tannin around the sori. It causes no warty growth in resistant varieties, where phenolic compounds rapidly accumulate in the vacuoles of cells, several layers deep, around the place where sori begin to develop.—(*Courtesy Biol. Abs.*)

Joined spores of Ascochyta viciae, W. Crosier (*Phytopathology, 25 (1935), No. 2, pp. 283, 284*).—When a certain strain of *A. viciae* was cultured on autoclaved wheat straw, the pycnospores were joined by short tubes, and a compact mass of spores was formed. Other strains of this fungus grown on stems of sweetclover, winter vetch, bean, yellow trefoil, and on oat and rye straw produced only normal free spores.—(*Courtesy Biol. Abs.*)

Monograph of the Erysiphaceae of Lithuania [trans. title], K. Brundza (*Žemės Ūkio Akad. [Dotnava, Lithuania] Metraštis, 1933, pp. 107–197, pls. 4, figs. 11; Ger. abs., pp. 187–195*).—This claims to be the first comprehensive treatment of the powdery mildews of Lithuania. It presents 54 species in 6 genera on 232 species of host plants, with collection data, descriptive notes, ecological observations, and information on the morphology of the different forms, with particular reference to the conidial stage.

Nuclear phenomena in Helminthosporium gramineum, T. W. Graham (*Phytopathology, 25 (1935), No. 2, pp. 284–286, figs. 2*).—Cytologic studies at the Minnesota Experiment Station indicate that the mycelium, conidia, and germ tubes of *H. gramineum* are usually multinucleate, and that more than one nucleus may pass into the young conidium at the time of its formation. Hyphal fusions and cytoplasmic and nuclear interchange among these growth stages are frequent. The results lend supporting evidence to the theory of heterocaryosis as one explanation of genotypic change in this species and the origin of new races.—(*Courtesy Biol. Abs.*)

Antagonistic action of Trichoderma on Rhizoctonia and other soil fungi, M. C. Allen and C. M. Haenseler (*Phytopathology, 25 (1935), No. 2, pp. 244–252, fig. 1*).—The antagonistic action of a strain of what appeared to be *T. lignorum* on *Rhizoctonia* was studied under greenhouse and laboratory conditions at the New Jersey Experiment Stations. It was found that seed decay and damping-off of seedlings of cucumbers and peas were greater in soils inoculated with *Rhizoctonia* alone than in soils inoculated with both *Rhizoctonia* and *Trichoderma*. The growth of *Rhizoctonia* in artificial culture media was inhibited by the presence of *Trichoderma*. Filtrates taken from a 5-day-old *Trichoderma* culture were found to contain a toxic principle which killed or prevented the growth of *Rhizoctonia*. The toxic principle was apparently inactivated or destroyed when the filtrate was heated at 100° C. for 10 min., when oxygen was bubbled through it for 5 min., or when it was allowed to stand in cotton-plugged test tubes for 20 days. *Pythium debaryanum* was included in some of the tests, and seemed just as sensitive to the toxic principle.

Some detrimental effects of bordeaux mixture on plants, J. D. Wilson (*Ohio Veg. Growers' Assoc. Proc., 19 (1934), pp. 33–39*).—This contribution from the Ohio Experiment Station discusses the results of a series of experiments already referred to (E. S. R., 72, p. 790).

Formaldehyde does well in controlling damping off, C. M. Haenseler (*N. J. Agr., 17 (1935), No. 1, p. 4*).—Preliminary tests at the New Jersey Experiment Stations showed that damping-off of beets could be almost completely eliminated by sprinkling the seed bed immediately or within a few hours after seeding with 1 part of commercial formaldehyde solution in 200 parts of water at the rate of 1.5 pt. to the square foot. Trial for 5 yr. in commercial greenhouses has given excellent results in every case.

One part in 300 parts of water has given good control of damping-off of cucumber, melon, peas, tomato, eggplant, and pepper, and 1 part in 400 improved the stand of some of the more sensitive seed types. Radish, cabbage, and cauliflower were found to be extremely sensitive, however. Hence the author holds that the method should not be used at all for crucifers, and only with caution on other crops until proper concentration and dosage are determined for each type of seed and soil.

A portable rust-inoculation chamber, H. B. Humphrey and F. A. Coffman (*Phytopathology, 25 (1935), No. 2, pp. 279–281, figs. 2*).—A description and illustrations are given of a portable bottomless box, 8 by 4 ft. in area and 4 ft. high, with composition board sides and removable composition board cover. This may be carried into the field, placed over the plants to be inoculated, and fixed in place by driving into the soil the extended corner posts sharpened into pegs.

Losses from corn ear rots in the United States, N. E. Stevens and J. I. Wood (*Phytopathology, 25 (1935), No. 2, pp. 281–283, fig. 1*).—Records of losses due to ear rots, based on field observations and data on carlot shipments showing over 6 percent of damaged kernels derived from terminal market inspections from 1922 to 1933, are presented in a graph which discloses remarkably close agreement in the two sets of figures. The largest losses occurred in 1926.

Relation between number, size, and location of smut infections to reduction in yield of corn, I. J. Johnson and J. J. Christensen (*Phytopathology, 25 (1935), No. 2, pp. 223–233*).—Tests were made at the Minnesota Experiment Station to determine the effect of *Ustilago zeae* on the yield and quality of maize. More than 1,800 comparisons were made between adjacent smutted and smut-free plants of dent corn consisting of 3-way crosses, double crosses, and top crosses. Standard open-pollinated varieties and inbred lines were used also.

The extent of loss in yield of ear corn was found to be dependent upon the number, size, and location of the smut galls. On the average, single smut galls reduced the yield about 25 percent, and multiple galls approximately 50 percent. Smut galls located on the stalk above the ear were about twice as destructive as smut galls of similar size and number located below the ear, usually on shoots or suckers. Smut galls on the tip end of the ear were less destructive than galls of similar size more generally distributed through the ear. Medium and large galls on the tassels caused heavy reduction in yield, but small galls on the tassels were not injurious. Ears from smut-infected plants tended to have a poorer kernel luster than those from smut-free plants, and also were more likely to be infected with ear rots.—(*Courtesy Biol. Abs.*)

Field reaction of varieties and selfed lines of corn to different collections of Ustilago zeae, J. J. Christensen and I. J. Johnson (*Jour. Agr. Res. [U. S.], 50 (1935), No. 1, pp. 47–57*).—Continuing the work already reported (E. S. R., 68, p. 65), a study was made at the Minnesota Experiment Station of the behavior

of 5 varieties and 95 selfed lines of corn under field conditions when inoculated with collections of *U. zeae* from the University Farm, St. Paul, and with collections obtained from numerous localities in 12 different States east of the Rocky Mountains. In general, the relative reactions of all the lines of corn to local and nonlocal smut were similar on the two fields. The annual correlation coefficient between percentages of smut infection in replicates of each field inoculated with local and nonlocal smut, respectively, were essentially of the same magnitude as those between single replicates of the different fields inoculated.

Lines of corn resistant to local smut collections were resistant also to smut obtained from widely different sources. Growth and environmental factors caused greater fluctuation in prevalence of smut than did the different collections of smut. Selfed lines of corn had a tendency to become infected at definite locations irrespective of the collections of smut used. Different smut collections did not influence the number and size of smut galls that developed per infected plant.

Histological studies of rice leaves infected with Helminthosporium oryzae, E. C. TULLIS (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 1, pp. 81–90, figs. 6*).—In rice leaves affected with leaf spot caused by *H. oryzae*, the hyphae of the fungus were found to grow intercellularly in the photosynthetic areas and intracellularly in the "motor cells" and bundle sheath. Bundles constituted a barrier to lateral spread of the fungus. The bundle sheaths of resistant varieties were less easily penetrated than those of the susceptible varieties. Deposits, the chemical nature of which have not been determined, were found in the intercellular spaces about an infection. In resistant varieties the fungus was hemmed in by these deposits restricting the fungus to the region of primary invasion. In these studies the U. S. D. A. Bureau of Plant Industry cooperated with the Arkansas, Louisiana, and Texas Experiment Stations.

On the possibility of infection of dry-treated wheat by soil-borne Tilletia tritici [trans. title], V. VILKAITIS (*Žemės Ūkio Akad.* [*Dotnava, Lithuania*] *Metraštis, 1933, pp. 69–77; Ger. abs., p. 77*).—The results of the author's experiments with different seed-treatment materials for the control of wheat bunt are given. A field test showed that seed treatment with a mercurial dust only partially reduced infection in artificially contaminated soil.

Wilt and cold resistance of self-fertilized lines of alfalfas, G. L. PELTIER and H. M. TYSDAL (*Nebraska Sta. Res. Bul. 76* (*1934*), *pp. 26, figs. 3*).—The relative reactions to cold and wilt (*Aplanobacter insidiosum*) of a large number of self-fertilized lines of alfalfa through the fifth generation are reported. The methods used in the controlled cold and wilt determinations are given. The foundation materials from which selections were made consisted of selected plants from a number of old Nebraska fields and a large collection of seed lots assembled by the U. S. D. A. Bureau of Plant Industry from many of the alfalfa-growing regions of the world. The following results were obtained:

"Selfing without elimination or with cold elimination only resulted in decreasing wilt resistance with advancing generations. Wilt elimination, within self-fertilized lines, resulted in maintaining the wilt resistance of originally highly resistant parents, or of increasing the wilt resistance of originally moderately resistant parents.

"There is a marked inheritance of wilt resistance, as evidenced by the fact that higher resistance among parental groups resulted in higher resistance of the progeny. The parental group having the highest resistance produced progeny with the greatest uniformity with respect to wilt resistance. The ad-

vanced selfed generations bred truer for wilt resistance, the fifth being much more uniform than the first or second generation.

"Some lines were consistently high in wilt resistance.

"High wilt and cold resistance do occur in the same individuals, but the results point to independent segregation. More than one factor, possibly three, are involved in the inheritance of wilt resistance. Data so far obtained also indicate that more than one factor are involved in the inheritance of cold resistance.

"In general, the reaction of lines to cold resistance upon selfing has shown the same behavior as the wilt studies already mentioned. Rigid elimination by cold within self-fertilized lines has served to maintain cold resistance, although selfing without elimination tends to markedly decrease cold resistance.

"Preliminary results of compositing seed from desirable plants or 'strain building' indicate promising possibilities by this method."

Incubation period of pea mosaic in the aphid, Macrosiphum pisi, H. T. OSBORN (*Phytopathology, 25 (1935), No. 2, pp. 160–177, figs. 2*).—Pea mosaic (obtained from *Vicia faba* in New York State) was found to require an incubation period in *M. pisi* before it can be transmitted by this carrier. This was shown by exposing series of healthy *V. faba* plants to colonies of the aphid that had fed for from 2 to 12 hr. on diseased plants. The colonies consisted of from 50 to 200 aphids each. An incubation period of the virus was definitely demonstrated for 23 colonies. In 20 colonies the period varied from not less than 9 hr. nor more than 15 hr. to not less than 21 hr. nor more than 48 hr. In 1 colony the period was not less than 72 hr. nor more than 96 hr., while in 2 colonies held at temperatures of from 80° to 90° F. it was not less than 4 hr. nor more than 10 hr. Retention of the virus by the aphids was shown in 1 colony over a period of 29 days. *M. gei*, as well as *M. pisi*, transmitted the disease, but *Aphis rumicis* did not. Transmission by mechanical methods was found difficult. The symptoms produced by the virus on *V. faba*, *Pisum sativum*, *P. sativum arvense*, *Lathyrus odoratus*, and *Trifolium incarnatum* are described.—(*Courtesy Biol. Abs.*)

The latent virus of potatoes, L. K. JONES, E. J. ANDERSON, and G. BURNETT (*Phytopath. Ztschr., 7 (1934), No. 1, pp. 93–115, figs. 3*).—A 2-yr. study, conducted at the Washington Experiment Station with tomato and tobacco plants as indicators, showed that the latent or X virus was present, generally in mild form, in about 1,200 potato plants, including 12 varieties. The majority of these were apparently healthy, while the rest were affected with various virus diseases.

It was found that the virulence of the latent virus could be intensified by successive passage through tobacco plants to such an extent that it became capable of producing rugose mosaic symptoms on virus-free Early Rose potato plants. It was also modified by passage through *Nicandra physaloides*. *Amaranthus retroflexus* was added to the list of known suscepts of the latent virus.

It is suggested as a possibility that various virus diseases of the potato, including rugose mosaic (crinkle "A"), crinkle mosaic, mild mosaic, and the various forms of streak may be produced by modifications of the latent virus without the addition of any other virus entity. It is held that if this hypothesis is correct, the Z virus may be an attenuated or modified form of the Y virus. Further investigations are considered necessary to determine the effects of cultivated and weed hosts in modifying potato viruses.

Streak disease and pseudodegeneration of the potato: Attempt to analyze a case of serious, progressive disturbance of growth [trans. title], E. KLAPP and F. SPENNEMANN (*Pflanzenbau, 11 (1934), No. 2, pp. 67–78, figs. 6*).—

The potato varieties Industrie and Edeltraut, in an experimental area on loess loam soil in a warm climate, developed very pronounced symptoms of streak. The soil had a strong alkaline reaction and had been regularly fertilized with $CaCN_2$. Progeny of the badly affected plants became quite healthy in the third generation. In pot experiments using the above-mentioned soil the plants remained healthy when ammonium sulfate or flowers of sulfur were applied, but symptoms developed again with the application of $CaCN_2$. This environmental type of streak, developing in the experimental area progressively up to complete failure followed by restoration of health in the third generation, is held not to be systemic since it proved capable of recovery.—*Courtesy Biol. Abs.*)

Dusting and spraying experiments for the control of sugar-beet leaf spot in southern Minnesota, E. L. LeClerg (*Phytopathology, 25 (1935), No. 2, pp. 234–243*).—In cooperative work by the U. S. Department of Agriculture and the Minnesota Experiment Station, dusting and spraying experiments were conducted in 1931 and 1932 for the control of *Cercospora beticola*, using bordeaux mixture 4–4–50 and copper-lime dust 20–80. In 3 tests, under epidemic conditions, significantly increased yields were obtained in all sprayed plats, whereas significant increases from dusted plats were obtained in only 2 tests, although the third test approached significance. Field observation indicated for the dusted plats a somewhat lower measure of leaf spot control than the sprayed plats, but the yields proved to be nearly identical. Gross sugar per acre was favorably influenced by both dusting and spraying.—(*Courtesy Biol. Abs.*)

Studies on properties of the curly top virus, C. W. Bennett (*Jour. Agr. Res. [U. S.], 50 (1935), No. 3, pp. 211–241, figs. 5*).—Exudate from phloem tissue and the water wash (with 5 percent sucrose added) of an alcoholic precipitate of centrifuged, expressed beet juice were utilized for the artificial feeding of beet leaf hoppers (*Eutettix tenellus*), which were used as the agents of transmission. The concentration of the virus in the phloem exudate was found considerably greater than that in the beet juice, indicating a close relationship between the virus and the phloem tissue. The virus passed the common Berkefeld and Mandler filters.

At room temperature the virus remained active from 7 to 14 days in beet juice and was active after 18 mo. in frozen media. In dried material it remained active from 2 to 10 mo., longevity varying with the material containing the virus.

The virus proved very resistant to the action of alcohol, acetone, copper sulfate, bichloride of mercury, formaldehyde, and carbolic acid. Inactivation occurred at reactions of pH 2.9 and lower, but activity was retained at reactions up to and including pH 9.1.

The thermal inactivation point lay between 75° and 80° C. A 10-min. exposure to a temperature of 76° to 79° caused marked attenuation, and in its attenuated condition the virus proved relatively stable.

Expressed juice from beets and from a number of other kinds of plants caused inactivation in periods ranging from 30 min. to 14 days, depending on the species of plant from which the juice was derived. The time required for inactivation was not correlated with the degree of resistance to curly top. Since the virus is believed to be more or less restricted to the phloem, it is suggested that the substances causing inactivation in plant juices may occur in the parenchyma and function in restricting the virus to the phloem.

Factors affecting infection and decay of sweetpotatoes by certain storage rot fungi, J. I. Lauritzen (*Jour. Agr. Res. [U. S.], 50 (1935), No. 4, pp. 285–329, figs. 2*).—A study was made of the effect of temperature, humidity, and wounding

on infection of sweetpotatoes by *Rhizopus tritici*, *R. nigricans*, *Diplodia tubericola*, *Sclerotium bataticola*, *Fusarium oxysporum*, and other species of *Fusarium*. The investigations also included a study of the effect of healing (suberization and periderm formation) on infection by the various storage rot fungi.

Wounding was found to be an essential condition of infection by each organism. Ten types of wounding were employed in connection with *Rhizopus* infection studies. The percentage of infection by *Rhizopus* increased with the degree and extent of wounding. Infection by species of *Rhizopus*, *F. oxysporum*, and species of *Fusarium* causing end rot was influenced by the type of wounding.

Temperature and humidity were found to be factors influencing the presence and absence and rate of healing, which in turn affected the presence and absence and amount of infection and to some extent determined the particular disease that developed. In wounded roots stored for 10 days at temperatures from 12° to 37° C., combined with relative humidities above 90 percent, the critical temperatures for healing and infection usually ranged from 12° to 16°, but sometimes extended as high as 22°. At times temperatures of 35° and 37° permitted more infection than temperatures between 22° and 35°.

Curing by a 10-day storage of wounded sweetpotatoes at 22° to 32°, inclusive, with relative humidities of 90 percent and above, limited or excluded infection by the various fungi during subsequent storage. With a lowering of the relative humidity at temperatnres of 12°, 23°, and 28°, humidity became less favorable to healing, and a point was reached at which there was absence of healing. Wounded roots subjected to a 10-day storage at these unfavorable humidities became infected readily under subsequent favorable storage conditions. The proper curing of sweetpotatoes when placed in storage, however, promoted healing, thus inhibiting both infection and loss of moisture.

The relation of stream double refraction to tobacco mosaic virus, W. N. Takahashi and T. E. Rawlins (*Science, 81 (1935), No. 2099, pp. 299, 300*).—In this contribution from the University of California, the authors adduce experimental evidence tending to support the supposition that the stream double refraction (E. S. R., 69, p. 673) exhibited by the juice from mosaic-diseased tobacco plants is due to the virus particles themselves. At any rate, this technic was found to provide a rapid and reliable method of determining the virus concentration in such juice by determining the greatest dilution at which this phenomenon could be detected.

Effect of nitrogen supply on host susceptibility to virus infection, E. L. Spencer (*Phytopathology, 25 (1935), No. 2, pp. 178–191, figs. 6*).—Greenhouse experiments showed that N supply has a marked effect on the susceptibility of *Nicotiana tabacum* var. Turkish to infection with yellow tobacco mosaic virus (Johnson's tobacco virus 6) and on the susceptibility of *N. glutinosa* and *Phaseolus vulgaris* var. Early Golden Cluster to infection with green (ordinary) tobacco mosaic virus (Johnson's tobacco virus 1). Seedlings of the *Nicotiana* species were inoculated by the pin-puncture method, and susceptibility to infection was measured by the resulting number of lesions per 100 pin punctures. Seedlings of *P. vulgaris* were inoculated by rubbing the primary leaves with a cheesecloth pad, and susceptibility was measured by the number of primary lesions per leaf.

Results from the study of these three hosts indicate (1) that there is a definite correlation between host nutrition and host susceptibility to virus infection and (2) that host susceptibility is not governed mainly by host vigor as judged by green weight. Plants which made the most rapid growth were considerably less susceptible to infection than those in which growth was retarded by excess N. Small additions of N increased growth more than sus-

ceptibility. In tobacco the upper leaves at any N level were markedly more susceptible than the middle leaves, and these, in turn, were more susceptible than the lowermost leaves.—(*Courtesy Biol. Abs.*)

Studies on the nature of the causative agent of the mosaic disease of tomatoes, S. V. DESAI (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 626–638, pls. 4*).—A mosaiclike stunting disease of tomatoes occurred in Pusa in 1931, resulting in small, crinkled, deformed leaves with yellow patches. Mature leaves developed small necrotic areas, but no lesions were found on stems, petioles, or fruit.

Repeated attempts to isolate a causal organism by ordinary methods failed, and none was found by microscopic search. When, however, stem pieces from diseased plants were sterilized under vacuum for 10 min. at 37° C. with 1 : 1,000 $HgCl_2$ and, after sterile washing, were split lengthwise and transferred to a sterile tomato extract agar and incubated for a long time, bacterial growth appeared in some tubes after a week, in others after a month. The growth was alike and showed pellucid dots. Platings showed almost pure cultures of a single type of motile, spore-forming organism, with colonies having clear dots. That these transparent areas were due to a bacteriophage could not be demonstrated by the usual technic. Filtrates from cultures put through sterile Chamberland filters (from L3 to L13) after some time developed growth of the same type of bacteria, indicating a filter-passing stage.

Three sets of inoculations into healthy tomato plants by needle scratches on leaves resulted in the development of typical symptoms in all but one plant after periods ranging from a week to more than 3 weeks, while the controls remained healthy. Reisolation of the typical organism was made from inoculated plants, even from leaves and stems that had not been inoculated on such plants, but it was never recovered from healthy plants.

Cultures showed, in addition to rod forms with peritrichic flagella, many very fine granules, which with Zetnow's flagella stain showed a well-defined flagellum, as well as oval spores. Some of the physiological growth characteristics of the organism are reported.

The evidence points to the possibility that this tomato disease may be produced by a virus which is either a filter-passing stage in the pleomorphic cycle of the bacterial organism isolated or a constant associate of the latter.

A colored plate compares healthy and diseased leaves.

Macrosporium and Colletotrichum rots of turnip roots, C. CHUPP (*Phytopathology, 25 (1935) No. 2, pp. 269–274, figs. 2*).—Rots caused by *M. herculeum* and *C. higginsianum* on turnip roots are described. Isolations and inoculations on both leaves and roots were successful in tests at Cornell University. The *Macrosporium* was found to grow under the seed coat and could be killed by treating the seed for 10 min. with hot water at 50° C. The *Colletotrichum* was not proved to be carried in the seed, but the fungus was found to overwinter in infected leaf parts.—(*Courtesy Biol. Abs.*)

Market diseases of fruits and vegetables.—Apples, pears, quinces, D. H. ROSE, C. BROOKS, D. F. FISHER, and C. O. BRATLEY (*U. S. Dept. Agr., Misc. Pub. 168 (1933), pp. 71, pls. 22*).—This publication is the third in a series (E. S. R., 67, p. 405) designed to aid market inspectors and growers in the recognition of important pathological conditions affecting fruits and vegetables in the channels of marketing. Over 75 types of diseases and injuries are described and the majority illustrated, for the most part in color. Control measures are referred to, and important references are cited.

Antiseptic solutions and antiseptic adhesive tape in relation to control of hairy root, crown gall, and other overgrowths on nursery apple trees, A. J. RIKER, S. S. IVANOFF, and F. B. KILMER (*Phytopathology, 25 (1935), No. 2, pp.

192–207).—In cooperative work by the U. S. Department of Agriculture and the Wisconsin Experiment Station, increased efficiency of control methods against infectious graft knots was secured through the use of antiseptics. Various concentrations of 12 antiseptic solutions were employed against hairy root bacteria (*Phytomonas rhizogenes*) on the surface of apple seedlings. Mercuric chloride 1:1,000 and cadmium chloride 1:100 were effective in killing all the surface bacteria without root injury.

Several series of antiseptics were incorporated into the plaster masses of the nurseryman's tape, and their efficiency against the bacteria and action on the graft union were tested in laboratory and field trials. Mercuric chloride 1:300 by weight in the plaster mass proved to be the most satisfactory.—(*Courtesy Biol. Abs.*)

A soft rot of apple, P. K. Dey and B. S. Nigam (*Indian Jour. Agr. Sci., 3 (1933), No. 4, pp. 663–672, pl. 1, figs. 3*).—"A very large proportion of the apples in the markets in the United Provinces [India] are usually found to be damaged by a kind of soft rot." No fungus fructification is observed on these apples. Cultures from infected fruit and reinfection of sound fruit under controlled conditions put the responsibility for the losses upon an *Aspergillus* with purple-brown heads, described and figured as in *A. luchuensis* but named in the text *A. niger*.—(*Courtesy Biol. Abs.*)

Relations between the pollination and the stigmatic infection of the apple fruit rot fungus (Sclerotinia mali) [trans. title], Z. Shima (*Jour. Hort. Assoc. Japan, 5 (1934), No. 1, pp. 8–12*).—Pistils of the Jonathan apple and other fruits were infected with macroconidia of *S. mali* preceding, accompanying, or following self- or cross-pollination. Specimens were fixed at intervals, sectioned, and stained with cotton blue, while others were left on the tree. Infection was reduced in the plat where pollination (cross-pollination in particular) preceded the application of the spores.

Microscopic examination showed that the hyphae entered the embryo sac through the micropyle, traveling the same course that pollen tubes do. It was also demonstrated that the hyphae reached the ovule within 48 hr. after infection under favorable conditions, while the pollen tube required 72 hr. In these tests the fungus also attacked ovules of European pear, Japanese pear, quince, and medlar in the same manner, though the rot of these fruits, when young, is not known in nature.—(*Courtesy Biol. Abs.*)

Variability of monosporic cultures of Coccomyces hiemalis, R. O. Magie (*Phytopathology, 25 (1935), No. 2, pp. 131–159, figs. 6*).—In this study at the Wisconsin Experiment Station, a large number of single ascosporic isolates of the cherry leaf spot fungus from 6 States were compared as to their morphology, physiology, and pathogenicity, and were found to differ from one another in conidial length, conidial production, growth rate, acid production, and certain colony characteristics. Slight variation was found in the utilization of sources of carbon and of nitrogen, and in conidial germination in relation to pH and to temperature. The dependence of growth on the presence of accessory growth factors was suggested. The existence of well-defined physiological forms among the isolates was not indicated by the results of infection experiments on *Prunus cerasus* (Montmorency), *P. mahaleb*, and *P. avium* (Governor Wood). All isolates were obtained from sour cherry (*P. cerasus*).

A serious Phytophthora infection of peach trees [trans. title], M. Curzi (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat., e Nat., 19 (1934), No. 11, pp. 817–820*).—The author reports a serious collar rot of peach trees due to *Phytophthora*. Although common and widespread, the disease had previously been confused with other infections or with injury due to climatic

conditions. In the majority of cases a species of *Phytophthora* close to *P. syringae* was isolated, but in one case a species close to *P. cactorum* was obtained. Infections are reported to occur usually during the dormant period from October to spring, the persistence of moisture about the base of the tree being the condition most favorable for their development. Laying bare the collar of the tree and treating the base of the trunk and surrounding soil with bordeaux mixture (3 to 5 percent) proved efficacious in checking the spread of the disease.

The life history of Taphrina deformans, A. J. Mix (*Phytopathology, 25 (1935), No. 1, pp. 41–66, figs. 6*).—A review of the literature shows no convincing evidence that *T. deformans* possesses a perennial mycelium. The author holds that there is, however, evidence that conidia derived from ascospores by budding may survive and cause infection the following spring. Renewed attempts to isolate the fungus from the surfaces of healthy peach twigs were, as in earlier work, unsuccessful. Inoculation experiments showed not only that infections follow the application of conidia to the young unfolding leaves, but that such infections may occur more than a year after the conidia are applied to the twig surfaces. A bagging experiment showed that when ascospores were prevented from reaching twig surfaces curl did not occur the following spring. Evidence is presented indicating that the hibernating stage is not confined to the surface of bud scales, but may survive on all surfaces of the dormant tree. Histological study of diseased peach twigs showed that mycelium is not perennial in the tissues.

Infecting conidia were found to send germ tubes through the outer wall of the lower epidermis of young leaves, not through stomata. The development of the fungus within the tissues following infection is described. Evidence was obtained, from a study of cells in culture and of stained preparations, of the occasional occurrence of conjugation between conidia and even between long irregular tubes emerging from conidia. On the basis of careful experiments with conidia from various monosporous cultures, however, the author believes that copulation of conidia of *T. deformans* occurs only occasionally, in marked contrast to the situation found in *T. epiphylla* and *T. klebahni*. The dicaryophase, in this fungus, was found normally to originate by division of the nucleus of one conidium.

An inoculation experiment showed that conidia descended from each of the eight ascospores of an ascus were able to infect. Copulation of conidia proved, therefore, not to be a necessary antecedent to infection. Conidia caused infection after being grown in culture for 11 yr. Of the dicaryophase and diplophase, binucleate conidia, hyphae with binucleate cells (with conjugate division of nuclei), ascogenous cells, and asci may be formed in culture, the latter being imperfect and often abortive. Saprophytic growth (as evidenced by growth in culture) was found, however, to be initiated only by haploid cells, ascospores, or conidia.

The false-blossom disease of cranberries, R. B. Wilcox and C. S. Beckwith (*New Jersey Stas. Circ. 348 (1935), pp. 4*).—This is a discussion, for the benefit of the grower, of the symptoms, method of transmission, and mode of control of this virus disease, which is spread by the blunt-nosed leaf hopper. Suggested control measures include selection of healthy planting stock and suppression of the insect carrier by spraying or dusting with pyrethrum, flooding and applying kerosene, or holding the winter flowage until early July.

A Stilbum disease of fig in Louisiana, E. C. Tims (*Phytopathology, 25 (1935), No. 2, pp. 208–222, figs. 2*).—This contribution from the Louisiana Experiment Station reports a new disease of fig (*Ficus carica*) caused by *S.*

cinnabarinum found in Louisiana in 1932. Diseased branches are characterized by the presence on the surface of small, round, pink fungus heads borne on short stalks, the heads being composed of small, oval, unicellular, hyaline conidia. This fungus, which is usually confined to tropical countries, was often found to be quite destructive in moist, shady places. Infection appeared to take place principally through wounds and leaf scars. The Celeste variety was found to be damaged more than other varieties under natural conditions in Louisiana. The ascigerous stage (*Megalonectria pseudotrichia*) has been found associated with the conidial stage.

Pruning out diseased branches and painting the cut surfaces helped to control the disease.—(*Courtesy Biol. Abs.*)

On the mode of action of copper sprays at the moment of application [trans. title], J. Branas and J. Dulac (*Compt. Rend. Acad. Sci.* [*Paris*], *197* (*1933*), *No. 17, pp. 938–941*).—Laboratory studies indicated that Burgundy and bordeaux mixtures, whether acid, neutral, or alkaline in reaction, contain, at the time they are put on, sufficient copper in solution to insure adequate protection against the grape mildew *Plasmopara viticola*. The solubility of these copper compounds after being dried down was not investigated.

Gnomonia nerviseda, the perfect stage of the fungus that causes the vein spot disease of pecan foliage, J. R. Cole (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 1, pp. 91–96, figs. 2*).—Vein spot, a foliage disease of pecans, *Hicoria* (*Carya*) *pecan*, was collected in Arkansas, Louisiana, Mississippi, and Texas. The disease attacks the rachis, the petiole, or the veins, and is always confined to the vascular system of the leaf. The pycnidial stage of the vein spot fungus, *Leptothyrium nervisedum*, does not appear until summer or early fall, while the perfect stage appears the following spring on the fallen leaves along the old vein spot lesions. The relationship was demonstrated between the pycnidial and the perfect stage. The latter is described in Latin and English and named *G. nerviseda* n. comb. The asci range from 36μ to 42μ by 8μ. The curved, guttulate, 1 septate ascospores range from 14μ to 15μ by 4μ to 5μ, are constricted at the septum, and bear a gelatinous appendage at each end. This species is held to be distinct from *G. setacea macrospora* Ell. and Ev., from a two-spored *Gnomonia* described by Matz in Florida, from *G. caryae* Wolf, and from *G. caryae pecanae* Cole.

Inoculations of Stagonospora curtisii on the Amaryllidaceae in California, C. O. Smith (*Phytopathology, 25* (*1935*), *No. 2, pp. 262–268, fig. 1*).—A leaf spot produced on *Hippeastrum* sp. and on different species of *Narcissus* by *S. curtisii* is reported as common in California during the rainy season. Isolations of *S. curtisii* were made from *Hippeastrum* sp., *Narcissus* sp., *Crinum powelli*, and from *Hymenocallis littoralis* sent from Bermuda. In trials at the California Citrus Experiment Station, successful wound inoculations were made by pure cultures from each of the four hosts on the following species of Amaryllidaceae: *Amaryllis belladonna*, *Chlidanthus fragrans*, *Crinum powelli*, *Galanthus* sp., *Hippeastrum vittatum*, *Hymenocallis calathina*, *Leucojum vernum*, *Lycoris squamigera*, *Narcissus* sp., *Pancratium maritimum*, *Sternbergia lutea*, and *Zephyranthus candida*.

The spores of *Stagonospora curtisii* were variable in size and number of septa. In some tests of dry herbarium material, spores were found viable after 1 yr., but not after 2 yr.—(*Courtesy Biol. Abs.*)

The Dutch elm disease eradication project: Federal, State, and local cooperation, L. H. Worthley (*U. S. Dept. Agr. Circ. 353* (*1935*), *pp. 4*).—This popular account summarizes existing information about the disease and the objectives and methods of governmental agencies looking to its eradication

from the United States. It indicates the way in which the public can cooperate by locating diseased elms, collecting elm insects, removing the dead and dying wood from elms, maintaining the vitality of elm trees by proper feeding, spraying against the elm leaf beetle and canker worms, and by other operations to prevent the harboring of elm bark beetles.

Observations on Tuberculina maxima, a parasite of Cronartium ribicola, E. E. HUBERT (*Phytopathology, 25 (1935), No. 2, pp. 253–261, figs. 2*).—A brief review is given of the European use of the purple mold *T. maxima* as a means of control of the white pine blister rust. Field experiments and laboratory tests made in Idaho indicate a slow-growing and sensitive organism not easily established on its host under the test conditions. Only 5 out of 72 direct inoculations in the field gave successful infection on blister rust cankers. Once established, the purple mold was capable of slow spread and inhibited aeciospore production. The author considers the possibilities of its use as a biological control agency to be remote, and in no way comparable in effectiveness with the eradication of the alternate hosts (*Ribes* spp.) as now practiced in America.

Dictyostelium discoideum, a new species of slime mold from decaying forest leaves, K. B. RAPER (*Jour. Agr. Res. [U. S.], 50 (1935), No. 2, pp. 135–147, pls. 3*).—Cultures from decaying leaves in a deciduous forest in North Carolina produced many colonies of *Dictyostelium*, among them a form which is here described in Latin and English and named *D. discoideum* n. sp. In this species, following the aggregation of the myxamoebae, the pseudoplasmodium became a compact cylindrical mass and moved for a greater or less distance over the culture plate before developing a sorocarp. This previously unreported migratory stage is termed the "migration pseudoplasmodium."

The mature sorocarp differs from that of the more common species in possessing a cellular basal disk, which surrounds and supports the base of the sorophore. In addition, the sorophore is more rigid and tapers more evenly than in other species.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on economic zoology] (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vol. 5, pp. 4055–4133, 4225, 4226, figs. 31*).—Contributions presented at the Fifth Pacific Science Congress, held at Victoria and Vancouver, B. C., June 4–15, 1933, and published in 1934, include the following: The Distribution, Abundance, and Economic Importance of the Game and Fur-Bearing Mammals of Western North America, by R. M. Anderson (pp. 4055–4075); Problems in the Conservation of Game and Fur-Bearing Mammals (pp. 4077, 4078) and What of the Predator? (pp. 4079, 4080), both by J. R. Dymond; Recent Researches into the Migratory Waterfowl Problem on the Pacific Coast, by J. Moffitt (pp. 4081–4085); Notes on the Breeding Grounds of Certain Species of Anatidae in Japanese Territory, by N. Kuroda (pp. 4087–4094); The Need of Further International Cooperation in the Study and Protection of Pacific Waterfowl, by T. S. Palmer (pp. 4095–4099); Further Contribution on the Biology of the Oyster, by S. Hatai (pp. 4101–4110); Note on the Japanese Oyster Larva, by T. Fujita (pp. 4111–4117); Factors Governing the Propagation of Oysters and Other Marine Invertebrates, by P. S. Galtsoff (pp. 4119, 4120); The Japanese Oyster in Canadian Pacific Waters, by C. R. Elsey (pp. 4121–4127); and The Pearl Oyster and the Pearl in the Lagoons of the Archipelago of Tuamotu, by F. Hervé (pp. 4129–4133) (Eng. abs.).

Discussions on some of the papers are included (pp. 4225, 4226).

The life history of the rufescent woodchuck, Marmota monax rufescens Howell, W. J. HAMILTON, JR. (*Ann. Carnegie Mus., 23 (1934), pp. 85–178, pls. 6, figs. 9*).—This contribution on the rufescent woodchuck, based in large part on observations at Ithaca, N. Y., is presented in connection with a list of 29 references to the literature.

The vampire bat: A presentation of undescribed habits and review of its history, R. L. DITMARS and A. M. GREENHALL (*Zoologica [New York], 19 (1935), No. 2, pp. 53–76, pls. 3, fig. 1*).—A report of studies of *Desmodus rotundus* based upon observations in Panamá and Trinidad in 1933 and 1934 and in captivity. A list is given of 73 references to the literature.

On the food of the barn-owl and its bearing on barn-owl population, C. B. TICEHURST (*Ibis, 13. ser., 5 (1935), No. 2, pp. 329–335*).—Notes are presented on the food of *Tyto alba alba* in England in 1933, based upon the examination of pellets.

[Quail investigations], H. L. STODDARD (*Coop. Quail Study Assoc. Ann. Rpts., 1 (1932), pp. 7; 2 [1933], pp. 14; 3 (1934), pp. 17*).—These reports deal with the progress of work in Georgia and neighboring States conducted by the Cooperative Quail Study Association through H. L. Stoddard, director of the experimental work and consultant in matters relating to quail management. Studies referred to include cover plantings, use of fire on quail lands, result of the introduction of the so-called "Mexican" quail, destruction of hatching quail by fire ants, diseases and parasites of quail, etc.

The sparrows of New Jersey, L. A. HAUSMAN (*New Jersey Stas. Bul. 580 (1935), pp. 32, figs. 26*).—This continuation of the series of bulletins by the author on the birds of New Jersey (E. S. R., 69, p. 682) deals with 11 species of sparrows occurring in the State, including their appearance and identification, habits, and range within the State, particular attention being given to their food. Notes are also given on 5 additional forms of local or rare occurrence. The dietary of each form is graphically figured. A comparative chart of the dietaries of native birds and a key to the male fringillids of the sparrow group of New Jersey are included.

The tanagers and finches, A. A. ALLEN (*Natl. Geogr. Mag., 67 (1935), No. 4, pp. 505–532, pls. 8, figs. 6*).—This eleventh contribution (E. S. R., 72, p. 805) is illustrated by colored plates prepared by A. Brooks.

Birds of Canada, P. A. TAVERNER (*Canada Dept. Mines, Natl. Mus. Canada Bul. 72 (1934), pp. [2]+445, pls. 87, figs. 488*).—Following the introductory account (pp. 1–17), an annotated list is given of the ornithological literature (pp. 18–23) and a key, illustrated by C. Johnson, to the birds of Canada (pp. 23–36). Descriptive accounts, arranged systematically, include information on their economic status (pp. 37–410). Eighty-seven colored plates, prepared largely by A. Brooks and F. C. Hennessey, of 173 or more forms and text figures by the author illustrate the birds considered. A glossary, general index, and index to French vernacular names, and an index to check-list numbers are included.

The birds of Nippon, Vol. I, pts. 3–4, PRINCE TAKA-TSUKASA (*London: H. F. & G. Witherby; Tokyo: Yokendo, vol. 1, pts. 3, 1934, pp. XXVII–LVI+129–168, pls. 7; 4, 1935, pp. LVII–LX+169–238, pls. 8, fig. 1*).—Parts 3 and 4 are presented of the first volume of the work previously noted (E. S. R., 69, p. 230).

Life history of Longistriata musculi, a nematode parasitic in mice, B. SCHWARTZ and J. E. ALICATA (*Jour. Wash. Acad. Sci., 25 (1935), No. 3, pp. 128–146, figs. 16*).—A brief report is made of observations of the life history of *L. musculi*, a trichostrongyle parasitic in the intestine of the mouse (*Mus musculus*) and readily reared to fertile maturity in white mice.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 420, 495–497, 504*).—The notes here contributed (E. S. R., 73, p. 70) are as follows: *Sphaerites glabratus* from British Columbia (Coleop.: Sphaeritidae), by F. G. Meserve (p. 420); Does Laundering Impair the Efficiency of Mothproofing with Sodium Fluosilicate? by S. Marcovitch (pp. 495, 496), contributed from the Tennessee Experiment Station; Toads in the Control of Auto-Camp Insects, by G. F. Knowlton and C. F. Smith (p. 496), contributed from the Utah Experiment Station; Applications of Atomized Oil Sprays to Certain Truck Crop Insects, by T. C. Allen (p. 496); The Effects of Attack by *Pissodes terminalis* Hopping on Lodgepole Pine in California, by K. A. Salman (pp. 496, 497); and Preoviposition Period of the Apple Maggot Fly (*Rhagoletis pomonella* Walsh) in Eastern New York, by R. W. Dean (p. 504), contributed from the New York State Experiment Station.

[Contributions on economic insects and their control] (*Proc. 5. Pacific Sci. Cong., Canada, 1933, vol. 5, pp. 3349–3584, figs. 7*).—Contributions presented at the Fifth Pacific Science Congress, held at Vancouver and Victoria, B. C., June 4–15, 1933, and published in 1934, include the following: Recent Research on Mosquitoes in Malaya, by E. P. Hodgkin (pp. 3349–3354); Descriptive Note on an Exhibition of Photographs Illustrating Typical Breeding Places of Mosquitoes in Western Canada, by E. Hearle (pp. 3355, 3356); Veterinary Entomology in the Netherlands Indies, by B. J. Krijgsman, trans. by R. Ruedy (pp. 3357–3360); The Blood-Sucking Species of the Genus *Musca* and the Evolution of the Blood-Drawing Proboscis in the Genus, by W. S. Patton (pp. 3361–3366); Recent Studies of Tick-Borne Diseases Made at the United States Public Health Service Laboratory at Hamilton, Montana, by R. R. Parker (pp. 3367–3374); A Summary on Tick Parasites, by R. A. Cooley and G. M. Kohls (pp. 3375–3381); Recent Advances in Knowledge of Insect Fauna of South Sea Islands, by D. T. Fullaway (pp. 3383, 3384); The Chief Forest Insect Problems of the Pacific Coast of North America, by R. Hopping (pp. 3385, 3386); Control of Defoliating Insects in Forests, by J. M. Swaine (pp. 3387–3393); Quantitative Methods in the Study of Forest Insects, by J. J. de Gryse (p. 3395) (E. S. R., 71, p. 667); A New Method of Obtaining an Accurate Estimate of the Number of Insects Infesting Storm-Ravaged Forests, by I. Trägårdh (pp. 3397–3404); Recent Developments in Insecticide Research, by R. C. Roark (pp. 3405–3410); Recent Research in Insecticides: Substitutes for Lead Arsenate, by D. C. Mote and B. G. Thompson (pp. 3411–3417), contributed from the Oregon Experiment Station; Recent Researches in Insecticides: Oil Sprays, by E. J. Newcomer (pp. 3419–3422); Recent Researches on Insecticides in Great Britain, by C. T. Gimingham (pp. 3423–3437); A New *Thripoctenus* Parasite [*T. vinctus*] from the Philippines, by D. T. Fullaway and I. D. Dobroscky (pp. 3439–3444); Citrus Insect Problems of the Pacific Region, by H. J. Quayle (pp. 3445–3449), contributed from the California Citrus Experiment Station; Insect Pests of Citrus Trees in Formosa, by T. Shiraki (pp. 3451–3454); The Locust Problem in the Pacific Countries of Asia, by B. P. Uvarov (pp. 3455–3458); The Grasshopper Problem in Canada and the United States, by J. R. Parker (pp. 3459–3471); Entomological Problems of Wheat Growing in Canada, by H. L. Seamans (pp. 3473–3481); Brief Review of Agricultural Entomology in the Netherlands East Indies, by S. Leefmans (pp. 3483–3497); Growth and Progress of Applied Entomology in Japan (pp. 3499–3501) and Geographical Distribution of Lepidoptera in Pacific Countries (pp. 3503–3514), both by S. Matsumura; On Legislative Measures for Combating Agricultural Pests in Japan, by I. Kuwana and A. Kamito (pp. 3515–3520); Notes on a Newly Imported Parasite [*Prospaltella smithi* Silv.] of the Spiny White Fly [*Aleurocanthus spiniferus*

Quaint.] Attacking Citrus in Japan, by I. Kuwana (pp. 3521–3523); Some General Considerations in Parasite Introduction, by C. P. Clausen (pp. 3525–3529); Biological Control of Insect Pests in Hawaii, by O. H. Swezey (pp. 3531–3536); *Biological Control of Insect Pests in Canada, by* A. B. Baird (pp. 3537–3542); On the Control of *Eulecanium coryli* (L.) in British Columbia by the Parasite *Blastothrix sericea* (Dalm), by R. Glendenning (pp. 3543–3545); The Entomological Control of Noxious Weeds in the Pacific Region, by R. J. Tillyard (pp. 3547–3557); Fumigation for Insects, by D. B. MacKie (pp. 3559–3565); Protecting Pacific Countries against Invasion of Insect Pests: Canada, by L. S. McLaine (pp. 3567–3571); and Biological Studies on the Dermestid Beetle *Trogoderma granarium* Everts, by S. Nakayama (pp. 3573–3575).

Discussions on some of the papers are included (pp. 3577–3584).

[Contributions on economic insects and acarids in Kansas] (*Kans. State Hort. Soc. Bien. Rpt., 42 (1932–33), pp. 17–34, 48–59, 74–107, 126–130, 137–143, 202–210*).—Contributions here presented include the following: Control of the Codling Moth by Use of Oil Sprays, by A. J. Ackerman (pp. 17–23); Control of the Codling Moth, by D. P. Dell (pp. 23–26); Petroleum Summer Oil Sprays *(pp. 26–34) and Mites and Spiders, a Summary of the Distinguishing Characters* and Control Methods of the Clover Mite, Red Spider, and European Red Mite (pp. 48–50), both by G. A. Dean of the Kansas Experiment Station; Red Spider and Clover Mite, by D. P. Dell (pp. 50–52); The Apple Curculio in Northeastern Kansas, by P. G. Lamerson (pp. 53–57), contributed from the Kansas Experiment Station; The Oriental Fruit Moth in Kansas (*Grapholitha molesta* Busck=*Laspeyresia molesta* Busck), by H. B. Hungerford (pp. 57–59); *Pruning as an Aid to Codling-Moth* Control, by H. L. Lobenstein (pp. 74–77); *Value of Hootch Pots and Chemically Treated Bands in the Control of Codling* Moth, by L. W. Patton (pp. 77–82); The Value of Chemically Treated Bands in the Control of the Codling Moth, by C. D. Woodbury (pp. 82–84); Value of Hootch Pots and Chemically Treated Bands in the Control of Codling Moth, by G. T. Groh (pp. 85–89); Spraying for the Control of the Codling Moth, by G. A. Dean (pp. 89–93), Arsenical Compound Substitutes for Lead Arsenate in the Control of Codling Moth, by P. G. Lamerson and R. L. Parker (pp. 93–99), The Codling Moth and Factors Affecting Its Control, by R. L. Parker and P. G. Lamerson (pp. 100–107), The Spray Residue Problem in Kansas, by G. A. Filinger (pp. 126–130), and Strawberry Insects and Their Control, by G. A. Dean (pp. 137–143), all contributed from the Kansas Experiment Station; and The Control of Some Insects Infesting Garden Flowers and Ornamental Shrubs, by G. A. Dean (pp. 202–210).

[Cotributions on economic insects and their control in New Jersey] (*New Jersey Stas. Circs. 338 (1935), pp. 15, figs. 9; 346, pp. 4; 347, pp. 16, figs. 4; 349, pp. 4; 352, pp. 4; 353, pp. 2*).—These brief practical contributions deal, respectively, with Insect Pests of Boxwood, Greenhouse Fumigation with Calcium Cyanide, and The Control of Insect Pests of Lawns and Golf Courses, all by C. C. Hamilton; The Plum Curculio (*Conotrachelus nenuphar* Herbst), by B. F. Driggers; Homemade Oil Emulsions for Delayed Dormant Spraying, by J. M. Ginsburg; and Canker Worms [Spring Cankerworm and Fall Cankerworm], by Hamilton.

[Contributions on economic insects in Utah] (*Utah Acad. Sci., Arts, and Letters, Proc., 11 (1933–34), pp. 237–251, 257–270, 273–288, 291–294, figs. 38*).—Contributions from the Utah Experiment Station include the following: Beet Leafhopper Notes, by G. F. Knowlton (pp. 237–239); Chalcis-Fly Infestation of Alfalfa-Seed and Parasitism of the Chalcis-Fly in Utah, 1930 to 1933, Inclusive, by C. J. Sorenson (pp. 241–244); Some Cache Valley Utah Insects, by

G. F. Knowlton and W. L. Thomas (pp. 245, 246); Some Hyperparasites of the Alfalfa Weevil Parasite *Bathyplectes curculionis* (Thoms.) Occurring in the Uintah Basin of Utah, by C. J. Sorenson (pp. 249–251); Notes on Some Insectivorous Utah Lizards, by G. F. Knowlton and W. L. Thomas (pp. 257–259); Potato Psyllid [*Paratrioza cockerelli* (Sulc)] Investigations, by G. F. Knowlton (pp. 261–265); Preliminary Studies of Insect Transmission of Equine Encephalomyelitis, by G. F. Knowlton and J. A. Rowe (pp. 267–270); and Utah Horseflies, by G. F. Knowlton and T. O. Thatcher (pp. 291–294).

Other contributions include: Some Ectoparasites of Utah Birds and Mammals, by J. S. Stanford (p. 247); A Study of Some Utah Coccidae (Scale Insects), by D. D. Jorgensen (pp. 273–284); and Studies in the Weevils of the Western United States, No. 1, by V. M. Tanner (pp. 285–288).

Report of the Government entomologist, W. H. EDWARDS (*Jamaica Dept. Agr. Ann. Rpt., 1933, pp. 21–23*).—A brief report is made of the occurrence of and work of the year (E. S. R., 70, p. 649) with insect enemies of sugarcane, bananas, citrus, coconuts, and several other crops in Jamaica.

[Work with economic insects in Kenya], T. J. ANDERSON (*Kenya Dept. Agr. Ann. Rpt., 1933, pp. 137–145*).—The investigational work of the year (E. S. R., 70, p. 649) referred to relates to mealybugs of coffee (*Pseudococcus lilacinus* Ckll. and the citrus mealybug); *Antestia* and its parasites and *Asterolecanium coffeae* Newst., both by R. H. Le Pelley; and miscellaneous work, by F. B. Notley.

An automatic humidity control, G. V. B. HERFORD (*Ann. Appl. Biol., 21 (1934), No. 3, pp. 542–545, figs. 3*).—The humidity control apparatus described "consists of a powerful electric fan, which also drives, by pulley and belt, a small centrifugal water pump. A jet of water from this pump rotates a large cylinder of perforated zinc, 18 in. long by 10 in. in diameter, which dips into a deep tray of water. Suitable baffles are fitted to this cylinder, and air is blown over the wet metal by the fan; the arrangement of these baffles insures thorough saturation of the air."

Figures are given of the humidifier, showing fan, pump, and revolving drum; the control mechanism, showing plan and elevation; and the wiring (diagram).

A method for comparing the ovicidal properties of contact insecticides, E. P. BREAKEY and A. C. MILLER (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 353–358*).—The apparatus employed and the manner of testing the ovicidal properties of contact insecticides, based upon the procedure followed in sterilizing the eggs of blowflies preparatory to using the larvae in surgery, are reported upon.

A study of some fatty acids and their soaps as contact insecticides, L. E. DILLS and H. MENUSAN, JR. (*Contrib. Boyce Thompson Inst., 7 (1935), No. 1, pp. 63–82, figs. 5*).—In the course of the work reported the toxicity of some of the common fatty acids for the bean aphid and the rose aphid was determined.

"Capric and lauric acids were found to be more toxic than oleic, caprylic, myristic, caproic, and palmitic acids, while stearic was the least toxic of the fatty acids tested.

"The insecticidal value of the potassium soaps was determined. The order of toxicity of the soaps was found to be: Oleate, laurate, caprate, followed by the equally toxic caprylate, myristate, and palmitate which are more toxic than the stearate and caproate. The addition of nicotine to the soap solutions did not alter the order of toxicity. When the soaps and nicotine sulfate were combined, it was found that the toxicity due to the nicotine was not strictly additive; the better spreading soaps increased the effectiveness of the nicotine. The toxicities of the soaps and nicotine sulfate have been compared with some of the commercial spreaders for nicotine. Potassium soaps made from olive,

coconut, castor, corn, palm, cottonseed, and menhaden fish oil were tested on several species of aphids and one species of thrips. Olive oil soap, containing the highest percentage of oleate, was found to be the most toxic. The surface tension and angle of contact of the potassium soaps were determined. The relation of physical properties to the toxicity of the soaps has been examined.

"Tests conducted on six species of plants showed that the order of toxicity of the fatty acids to plants is the same as that obtained with insects. Plant tolerance for the soaps of the fatty acids increased with the increase in size of the soap molecule."

Halowax as an ovicide, E. P. Breakey and A. C. Miller (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 358–365, figs. 11*).—In continuation of work in which it was found that Halowax, a chlorinated naphthalene product, possessed ovicidal properties when applied to eggs of the common red spider (E. S. R., 71, p. 346), an attempt was made to compare its ovicidal properties with those of the various substances commonly employed as contact insecticides, including nicotine, petroleum, pyrethrins, and rotenone. The details are given in chart form.

Some recent developments in regard to tar distillate and tar-lubricating oil sprays, F. Z. Hartzell, S. W. Harman, and T. W. Reed (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 263–268*).—Contributing from the New York State Experiment Station, the authors report upon the relation of oil sprays to trees weakened by extreme winter weather, the approximate standardization of oil sprays, and the correct labeling of all oil preparations intended for use on trees.

"On trees severely weakened by the winter each kind of oil used at strengths necessary for San Jose scale or rosy [apple] aphid appeared to cause considerable injury to the trees and to the set of fruit. On light to moderately weakened trees tar oil and also lubricating oil proved reasonably safe provided the concentration did not exceed 3 percent and the spray did not contain a mixture of the two oils. Winter hardy trees were uninjured by spring applications of either or both oils provided the total oil content did not exceed 5 percent.

"Fall treatment with tar-lubricating oil emulsions containing approximately 65 percent of creosote oil and 15 percent of lubricating oil on moderately vigorous and vigorous trees seems to indicate less injury to the limbs and set of fruit than did spring applications using the same dilutions, provided the total oil content did not exceed 4 percent. At higher concentrations the fall treatment produced practically the same effects as the spring applications."

It is pointed out that the use of oil sprays would be "greatly simplified if each manufacturer would make three preparations that could be mixed in any proportion without 'breaking' of the emulsions: (1) A creosote oil emulsion that contains no lubricating oil, (2) a lubricating oil emulsion that contains no creosote oil, and (3) a tar-lubricating oil emulsion having the creosote oil and the lubricating oil in the ratio of 2.4 to 3 for those regions where both San Jose scale and the rosy aphid are present."

Diesel oil emulsions as insecticides, W. Carter (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 268–284, figs. 6*).—Reporting upon work at the experiment station of the Pineapple Producers Cooperative Association, University of Hawaii, it is shown that "highly sulfonated oils are not necessary to the safe spraying of succulent plants. Diesel fuel oils, when adequately emulsified and dispersed in the spray water, have been successfully used for the control of *Pseudococcus brevipes* (Ckl.) on pineapples and for several species of scale on citrus and ornamental shrubs. Colloidal clays, principally bentonite, have been used and emulsions of 10–10–10 and 10–15–10 formulas have proved stable. Bentonites from varying sources differ materially in their reaction to emulsification with Diesel oil.

No correlation has been found between a crude gel test and emulsifying properties. The method of agitation used in emulsification has some bearing on the smoothness and homogeneity of the resulting emulsion. Homogeneity and stability of concentrated emulsions can be improved by increasing the amount of bentonite, by the addition of certain salts, and by blood albumin. Type of bentonite, methods of emulsification, and especially the dispersal of the oil-charged bentonite particles are factors affecting the safe use of the oil as an insecticide. Dispersal phenomena are not apparently dependent on pH, since there is no correlation between the pH salt solutions used in the spray water and dispersal. In addition, it has been shown that blood albumin, a neutral compound with colloidal characteristics, can be used to achieve dispersal.

"Leaf injury has been studied extensively. The anatomy of the pineapple plant insures the accumulation of a ring of concentrated emulsion on the leaf surface, and when leaf spotting occurs it is at that point. Increasing the amount of bentonite in the emulsion and the concentration of salts in the spray water has practically eliminated this leaf spotting on pineapples. Other plants, such as citrus and ornamental shrubs, have been sprayed with much higher concentrations than can be used safely on pineapples and no difficulty has been encountered.

"*P. brevipes* on pineapple has been controlled with 1–100 sprays. A number of species of scale insect on citrus and ornamentals have been controlled with concentrations of from 1–100 to 4–100."

The accumulative effect of oil sprays on apple trees, M. D. Farrar and V. W. Kelley (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 260–263*).—In the experiments reported, the details being given in tabular form, dormant oil sprays applied over 5- and 10-yr. periods to relatively young apple trees did not affect tree growth measurably under orchard conditions. "An application of 8 percent dormant oil has consistently delayed bud opening on all varieties from 3 to 7 days. Concentrations of 2 and 3 percent have occasionally caused a slight retardation for 2 to 3 days. Summer applications of an unsaturated oil of 32 sec. viscosity did not injure either fruit or foliage. An 83 sec. viscosity unsaturated oil injured both fruit and foliage. The saturated oils gave little to no injury when applied in three sprays of 2 percent concentration between June 25 and August 15. The growth of apple trees receiving three sprays of summer oil was not measurably different from the untreated controls."

Sulfated alcohols in insecticides, E. N. Cory and G. S. Langford (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 257–260*).—The authors report upon preliminary studies of sulfated alcohols aimed at the determination of their value as toxic agents for insects; as emulsifying agents for oils and other insecticides; as dispersing and carrying agents for certain insecticides, especially those that deteriorate in alkaline solutions; as wetting agents for alkaline as well as acid sprays; and as an aid in the removal of the arsenical and lead residues on sprayed fruit. Those investigated were sodium lauryl sulfate, sodium octadecyl sulfate, sodium oleyl sulfate, and sodium oleyl sulfate special.

Tests made of their comparative toxicity for the red-legged grasshopper have shown them to rate, in order of toxicity, as follows: Sodium lauryl sulfate, sodium oleyl sulfate special, soap, sodium oleyl sulfate, and octadecyl sulfate. "A spray of sodium lauryl sulfate at a dilution of 1 percent of the commercial product or 0.5 percent of active ingredient gave a kill on cabbage aphid varying from 92 to 98.2 percent, and on red spider the kill was 94 percent. At a dilution of 0.5 percent of the commercial or 0.25 percent of active ingredient, the kill was 71 percent for red spider and 20.5 percent for the cabbage aphid. Sodium oleyl sulfate special at 1 percent solution of the commercial product killed 92.1 percent of cabbage aphid.

"Plants vary in their susceptibility to injury from sulfated alcohols. Snapdragons will withstand a 1 percent solution of the commercial product of sodium lauryl sulfate, while a solution containing more than 0.25 percent will injure chrysanthemums. Lantana is injured by 0.5 percent solution. Sodium oleyl sulfate special is slightly more injurious to foliage than sodium lauryl sulfate. These conditions indicate that sulfated alcohols cannot be used alone as insecticides until the factor or factors causing plant injury are discovered and reduced."

It is concluded that as carriers of other insecticides some of the sulfated alcohols have potentialities, as demonstrated by the results obtained with nicotine sulfate 40 percent added at the rate of 1 part to 1,000 parts against the cabbage aphid.

"Using grasshoppers dipped for 10 sec., the addition of 0.01 percent pyrethrins to a 0.12 percent solution of sodium lauryl sulfate increased the average kill from either of the solutions alone from 10 percent to 66.6 percent. Using boxelder bugs dipped for 5 sec., results as follows were obtained: Nicotine sulfate 1–500, 10 percent dead; sodium lauryl sulfate 0.25 percent (commercial product), 0 percent dead; and sodium lauryl sulfate 0.25 percent solution, plus nicotine sulfate 1–500, 75 percent dead. As a mosquito larvicide, both sodium lauryl sulfate and sodium oleyl sulfate special at a dilution of 0.5 percent of the active ingredients showed decided toxicity."

All of the materials tested in this work may be used as emulsifying agents for petroleum oils, pine oils, and carbon disulfide. Sodium lauryl sulfate and sodium oleyl sulfate special are far superior at ordinary temperatures to either of the other two materials in their emulsifying properties. For emulsifying carbon disulfide, sulfated alcohols appear to be far superior to soap. It is concluded that as wetting agents sodium lauryl sulfate and sodium oleyl sulfate special have possibilities. Excellent wetting is obtained on such waxy leaves as cabbage and kohlrabi with 0.06 percent concentration of the active ingredient of the materials.

Derris insecticides.—III, Aphicidal properties of derris and cube root, J. M. GINSBURG and P. GRANETT (*New Jersey Stas. Bul. 581 (1935) pp. 12*).—This third contribution (E. S. R., 72, p. 75) relates to derris root, in the form of extracts, dusts, and water suspensions, alone and in combination with lead arsenate, sulfur, lime-sulfur, and lime, singly and combined, as tested on several varieties of aphids infesting different kinds of plants. Experiments were conducted to determine the compatibility of derris with these ingredients and to compare the aphicidal properties of several samples of derris varying in rotenone content from 0 to 9 percent. A comparison was also made of the aphicidal properties of samples of cube and derris roots, similar in their percentages of rotenone and total extractives. The results led to the following conclusions:

"The toxicity of derris root to aphids does not always bear a directly proportional relationship to its rotenone content, especially in samples containing a high percentage of rotenone. When efficient wetting ageuts are used, from 0.5 to 1 lb. of derris root, analyzing about 5 percent rotenone and 18 percent acetone extractives and from 0.25 to 0.5 pt. of commercial acetone extract, containing about 5 percent rotenone and 16 percent extractives per 100 gal. of spray are required to obtain 90 percent kill or higher. Derris and cube roots are practically equal in their toxicity to aphids, provided that they contain about the same amounts of rotenone and total extractives. The rate of kill was considerably slower when derris was applied as dust than when used as either water suspension or extract.

"The combination of lead arsenate with either hydrated lime or sulfur, singly or combined, caused a reduction in toxicity of derris to aphids ranging from 10 to 40 percent. This reduction was entirely overcome by the addition of sufficient quantities of wetting agents in either the extract or the suspension sprays. Similar reductions in toxicity of derris resulted from the admixture of liquid lime-sulfur. This reduction was fully corrected by sufficient quantities of wetting agent only in the suspensions but not in the extracts. In the latter sprays, reduction of about 15 to 20 percent toxicity to aphids was observed even in the presence of the wetting agent."

The nicotine vaporizer, a device for utilizing nicotine in the control of insect pests, R. H. Smith, H. U. Meyer, and C. O. Persing (*Science, 81 (1935), No. 2099, pp. 296, 297*).—This contribution reports further (E. S. R., 72, p. 508) upon work with a nicotine vaporizer in codling moth control.

A new spreader for nicotine, C. O. Eddy (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 469–472*).—In the testing of spreaders for nicotine at the Kentucky Experiment Station (E. S. R., 71, p. 348), a tar oil-oleic acid combination consisting of 5 percent of water, 7.4 percent of potassium hydroxide (92 percent flakes), 44.3 percent of pine tar oil (sp. gr. 1.035), 10 percent of ethylene glycol monoethyl ether, and 33.3 percent of oleic acid, referred to as "Spreader 385", was found to be four times as effective as the commercial liquid potassium soap spreaders in combating the bean aphid on nasturtium leaves. A second formula, which permits an increase of pine tar oil and a decrease in solvents, is effective, mixes more readily with water, and is cheaper, is composed of 5 percent of water, 7.4 percent of potassium hydroxide (92 percent flakes), 48.8 percent of pine tar oil (sp. gr. 1.035), 3 percent of isoamyl alcohol, 1 percent of phenol (85 percent), 1.5 percent of ethylene glycol monoethyl ether, and 33.3 percent of oleic acid.

"The dilution of 1 part in 1,000 parts, the effective dilution for Spreader 385, is equivalent to 1 lb., or approximately 1 pt., to 125 gal. At a rate varying from 1 to 2 pt. per 100 gal., Spreader 385 has been in use for 2 yr. in field tests in the control of aphids, leaf hoppers, and thrips on peaches, apples, grapes, and vegetable crops. From these experiments it seems that a minimum dosage of 1 pt. per 100 gal. is adequate for surfaces like nasturtium leaves infested with aphids. Proportionately larger dosages are required for surfaces that are more difficult to wet, just as with soap spreaders."

The control of some ectoparasites of laboratory rats by atomized pyrethrum extracts in oil, E. M. Searls and F. M. Snyder (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 304–310, fig. 1*).—It was found in work at the Wisconsin Experiment Station that "2 percent of an oil extract of pyrethrum adjusted to 2.1 percent pyrethrins was an efficient control of body lice [*Polyplax spinulosa* Burm.] on rats when applied by atomization. Under the conditions of this experiment 5 cc of the spray covered each animal effectively. Five percent of the extract did not increase the efficiency of the spray. About 81 percent of the mites [Acarina] present upon the rats were destroyed by the spray. Spraying with any of the concentrations used did not injure the rats. Immersion in a 2 percent dilution destroyed all of the lice on the rats immersed. Immersion tended to injure the rats and is not to be recommended except when necessary. Five percent dilution sprayed upon occupied cages controlled bedbugs without injury to rats."

Relations between chemical composition and insecticidal effectiveness of rotenone-bearing plants, H. A. Jones, F. L. Campbell, and W. N. Sullivan (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 285–292, fig. 1*).—The toxicity of extracts of 6 samples of derris root, 5 samples of cube root, 1 sample of haiari stem,

and 1 sample of *Cracca virginiana* root for houseflies was compared with the values of these samples as obtained by certain chemical determinations.

The amounts of rotenone present in the samples were too low to account for all the toxicity. In more than half of the samples the figures by the Gross-Smith test, considered as representing the sum of rotenone and deguelin, agreed with the toxicity value, but in other samples they were lower. Total extractive values were higher than toxicity, and values based on the methoxyl content of the extract were somewhat closer but were also too high. When an approximate value for toxicarol was subtracted from the methoxyl figures, the results agreed more closely with the toxicity figures in general than did the results of other determinations. However, it is impossible, on the basis of the present results, to recommend unreservedly any one of these chemical determinations as a measure of the insecticidal effectiveness of rotenone-bearing plants. Further work is needed on this subject, particularly along the line of a more thorough study of the individual constituents present in such plant materials."

Arsenical substitutes.—I, Chemicals tested as arsenical substitutes in 1934, J. M. Ginsburg and P. Granett (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 292–298*).—The details of experiments with several groups of chemicals as arsenical substitutes, conducted at the New Jersey Experiment Stations, are reported in six tables.

"Of the 74 organic chemicals tested, pentachlorophenol, cinchonine, nicotine tannate, and diphenylguanidine were found to possess high toxicity to silk moth larvae; methoxyquinoline, diphenylguanidine, isoquinoline, and O-nitroanisol possess distinct repellency to silk moth larvae. Of the 13 inorganic chemicals tested, cadmium oxide and cadmium hydroxide proved highly toxic to silk moth larvae, [eastern] tent caterpillars, and confused flour beetles, but showed no toxicity to larvae of the Japanese beetle. Tested on plants, pentachlorophenol produced injury in high dilutions, while the two cadmium salts produced moderate injury to certain plants in concentrations of 0.50 percent or higher and no noticeable injury to any one of the plants tested at concentrations of 0.25 percent or lower."

Further experiments on organic thiocyanates as insecticides, F. Wilcoxon and A. Hartzell (*Contrib. Boyce Thompson Inst., 7 (1935), No. 1, pp. 29–36, fig. 1*).—A detailed account of the work previously noted (E. S. R., 73, p. 69).

Disinfection of bug-infested furniture by hydrocyanic acid, J. Johnstone Jervis (*Pub. Health [London], 48 (1935), No. 6, pp. 203–207*).—An account of the so-called "Leeds method" of fumigation adopted in work which followed the British Housing Act of 1930.

An improved model of an automatic insect flight trap designed to prevent the destruction of collected insects by water, R. A. Fulton and H. G. Bergen (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 491–493, figs. 2*).—An apparatus has been devised for the trap previously described (E. S. R., 65, p. 845) whereby practically all the water entering the trap during a rainstorm is by-passed to the ground and insects entering are retained by a wire screen and drop directly to the regular cyanide collecting jar.

Superheating as a control for cereal-mill insects, J. H. Pepper and A. L. Strand (*Montana Sta. Bul. 297 (1935), pp. 26, figs. 9*).—Following a brief introduction, review of earlier work, and discussion of the experimental method and apparatus employed, the details of the experimental work are reported in table and chart form. In the work with cereal mill insects, of which the Mediterranean flour moth and the confused flour beetle are the most important pests infesting Montana flour mills, it was found that "with a surface temperature of

150° F. a temperature of 120° was obtained to a depth of 6 in., in concrete after 10 hr. heating. When a means of air circulation was provided and the ceiling temperature allowed to rise to 180°, a floor temperature of 150° was obtained, well above that required in the successful use of this method. The air temperature gradient in the first 0.5 in. above the floor surface shows that, to be significant, temperatures must be taken in contact with the floor surface. If a thermometer is used to record the floor temperature, heat must be supplied for several hours after a lethal temperature has been recorded.

"The experiments show that for satisfactory results to be obtained with heat, all bags of flour and accumulations of cereal, etc., must be removed from the mill before heat is applied. There are large unit heaters now on the market which are capable of bringing about the desired high temperatures at very reasonable cost. The experimental results show that superheating if properly carried out should be completed in a period of 24 hr. or less."

Sulphur fumigation for the control of mushroom pests, A. C. DAVIS and H. D. YOUNG (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 459–465, figs. 2*).—It was found that "at 120° F. and 90 percent relative humidity in the fumigation chamber fumigations with maximum gas concentrations of about 6 mg mean concentrations of about 3.80 mg per liter, and requiring about 65 min. to drop to 1.5 mg per liter, seem to be close to lethal. Fumigations at maximum concentrations of 6 mg per liter or more, with mean concentrations of approximately 3.80 or 3.90 mg per liter and requiring 80 to 90 min. or more to drop to 1.5 mg per liter, should give complete kills of all insects and mites exposed. In the fumigation chamber at 100° and approximately 90 percent r. h., which represents as nearly as possible the conditions along the floor of the average mushroom house during the peak heat, maximum concentrations of 14.7 and 10 mg means of 7.22 and 6.11 mg per liter, and requiring 92 and 95 min., respectively, to drop to 1.5 mg per liter, gave less than 0.02 percent of survival. At this temperature a concentration having a maximum of 12 and a mean of 8 mg or more per liter, and requiring 110 min. or more to drop to 1.5 mg per liter, should give complete kill of all insects and mites exposed.

"In mushroom houses that are empty or off-bearing, at a temperature of 70° to 80° and 80 to 90 percent r. h., fumigations reaching a maximum gas concentration of 10 mg or more per liter, with a mean concentration of 5 mg or more and requiring 200 min. to drop to 1.5 per liter, should give complete kill of all insects and mites exposed to the gas. These concentrations are easily reached with the use of the outside sulfur burner, burning flowers of sulfur at the rate of 2 lb. per 1,000 cu. ft. of air space."

Insect and other pests of sugar-beet, F. R. PETHERBRIDGE (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 93 (1935), pp. 2–27 pls. 8, fig. 1*).—Continental pests of the sugar beet that are not pests in Great Britain are first considered, followed by an account of continental pests that are also pests in Great Britain.

[Tropical migratory locust and other pests of sugarcane in the Philippines], F. P. GOSECO (*Philippine Sugar Assoc., Res. Bur. Ann. Rpt., 1932–33, pp. 91–104, figs. 2*).—The occurrence of and observations upon the life history and habits of *Locusta migratoria migratorioides* R. & F., control methods, and natural enemies are reported upon. Other insects noted include the top borer *Topeutes intacta* Sn., which causes tamasoc or "dead heart", white grubs, mealybug parasites, the sugarcane leaf hopper and the spread of Fiji disease by it, and several other leaf hoppers.

Insect pests of the sweetpotato crop in Java [trans. title], C. J. H. FRANSSEN (*Landbouw [Buitenzorg], 10 (1934), No. 6, pp. 205–225, figs. 2; Eng. abs., pp. 222–225*).—Notes are presented on some 16 species of insects found to cause more

or less serious injury to the sweetpotato crop in Java. All but 2 of these, the lepidopteran *Herse convolvuli* L. and the sweetpotato weevil, are of minor importance.

[Insect and other enemies of tobacco in Deli in 1934], J. C. van der M. Mohr (*Meded. Deli Proefsta. Medan, 2. ser., No. 91 (1935), pp. 12–24*).—The more important enemies of tobacco in Deli in 1934 are noted.

Notes on the distribution of cured tobacco insects in the Near East, W. D. Reed (*Ent. Soc. Wash. Proc., 37 (1935), No. 2, pp. 42–48*).—A survey made of the distribution of cured tobacco insects in Greece and Turkey during the period July 29 to October 16, 1933, in which 68 tobacco warehouses were visited and 423 bales of tobacco were examined for insect infestation, is reported upon. The observations showed that the tobacco moth *Ephestia elutella* Hbn. and the cigarette beetle were widely distributed in Greece and Turkey, and that tobacco moth infestation was heavier and more widespread than that of the cigarette beetle.

Observations made in planters' homes, curing yards, and small warehouses in villages demonstrated that infestation of the tobacco moth and cigarette beetle may start prior to the delivery of the tobacco to merchants.

[Contributions on fruit insects and their control] (*Ill. State Hort. Soc. Trans., 68 (1934), pp. 153–191, 460–485, figs. 7*).—The contributions here presented are as follows: Progress in Control of Codling Moth in 1934, by W. P. Flint, S. C. Chandler, E. R. McGovran, and M. D. Farrar (pp. 153–176), contributed from the Illinois Experiment Station; Codling Moth Control in Colorado, by G. M. List (pp. 177–191), contributed from the Colorado Experiment Station; Codling Moth Control in Southern Illinois in 1934, by W. P. Flint (pp. 460–468), contributed from the Illinois Experiment Station; The San Jose Scale Situation, by S. C. Chandler (pp. 468–472); and What Is the Most Practical Control for Codling Moth? by M. S. Troth (pp. 473–485).

On the transmission of the strawberry virus "yellow-edge" disease by the strawberry aphis, together with notes on the strawberry tarsonemid mite, A. M. Massee (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 1, pp. 39–53, pls. 3*).—Experimental work with two suspected vectors of the yellow edge disease virus of the Royal Sovereign variety of strawberry at the East Malling Research Station is said to have proved the strawberry aphid to be a vector. The attempted transmission of the virus by the cyclamen mite resulted negatively.

Effect of a freeze on some citrus insects, J. R. W[atson] (*Fla. Ent., 18 (1935), No. 4, p. 54*).—Notes are presented on the effect of a cold wave of unprecedented severity that swept Florida during the nights of December 12 and 13, 1934, on the Florida red scale, purple scale, and cottony-cushion scale. The author records a mortality of 100 percent observed in the Florida red scale and of 80 percent in the purple scale on grapefruit trees in a low section of a grove at Vero Beach which was 50 percent defoliated by the temperature of 26° F. About half of the eggs of the purple scale escaped even where the scale insects themselves were killed. On higher ground where there was little defoliation the mortality among the Florida red scale was about 75 percent. Adults and larvae of the cottony-cushion scale on tung trees in a grove near Gainesville, examined January 9, 1935, had all been killed but the eggs had mostly survived, many having hatched, and the old cottony masses were swarming with young scales.

The important shade tree insects in 1934, E. P. Felt (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 390–393*).—A brief report upon the more important insect enemies of shade trees in the northeastern United States in 1934.

Recently introduced parasites of three important forest insects, P. B. DOWDEN (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 599–603*).—This contribution reports upon the progress of the introduction of parasitic enemies of the European pine shoot moth, larch casebearer, and the larch leaf-mining sawfly *Phyllotoma nemorata* Fall., which have in recent years become the source of serious injury in New England.

[**Work with forest insects in India in 1933–34**], C. G. TREVOR (*Forest Res. India, 1933–34, pt. 1, pp. 27–35*).—The work reported relates to insects affecting sal, teak, sandal, bamboos, champ, deodar, hollock, mulberry, oaks, and sissoo, to borers of timbers, and to termites, together with parasites and predators of teak defoliators.

[**Annual report of the Indian Lac Research Institute for the year 1933–34**], P. M. GLOVER (*Indian Lac Res. Inst. Ann. Rpt., 1933–34, pp. 35, pls. 4*).—Included in this report are accounts of the pests of host trees of lac insects (*Laccifer lacca*); the bionomics of *L. lacca*; insect enemies of *L. lacca*, particularly the predators *Eublemma amabilis* Moore, *Holcocera pulverea* Meyr., *Ephestia* sp., and *Eublemma scitula* Rambr. and parasites, of which eight species were reared from *L. lacca* during the year; and control measures.

Book-attacking insects in Cataluña (Catalonia) [trans. title], G. DEL CID (*Catalunya [Spain] Dept. Cult., Arx. Escola Super. Agr., n. ser., No. 1 (1934), pp. 24–30, figs. 7; Eng. abs., p. 30*).—This contribution relates to the attack of libraries in Cataluña by book worms, particularly *Anobium hirtum* Ill. The author finds its life cycle to be completed in about 2 mo., there being 3 or 4 generations each year. Other pests include the bostrichid *Psoa dubia* L., the book louse, several hymenopterans, and the straw itch mite.

The termite population of a mound colony of Eutermes exitiosus Hill, F. G. HOLDAWAY, F. J. GAY, and T. GREAVES (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 1, pp. 42–46, fig. 1*).—Studies made by the authors of the population of *E. exitiosus* present in four mounds of similar size made during the winter yielded records ranging from 750,000 to over 1,750,000.

A new chicken louse (Mallophaga: Philopteridae) from the Canal Zone, H. S. PETERS (*Ohio Jour. Sci., 35 (1935), No. 2, pp. 101–104, figs. 4*).—Under the name *Lipeurus angularis* n. sp. the author describes a louse taken from the heads of domestic chickens at Balboa, Canal Zone.

Method for making a grasshopper survey, R. L. SHOTWELL (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 486–491*).—In this contribution a method for making a grasshopper survey is described whereby the extent of an infestation is reduced to a mathematical basis, so that it can be used for determining in advance the amount of materials and the cost necessary for control in a county or State. Grasshopper populations are usually classified as "normal", "light", "moderate", "heavy", and "very heavy."

The 1934 grasshopper-control campaign, J. R. PARKER (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 314–323*).—The grasshopper control work in 1934 conducted cooperatively by Federal and State forces is reported.

Tenodera angustipennis Saussure established in southern New Jersey (Orthoptera: Mantidae), H. FOX (*Ent. News, 46 (1935), No. 4, pp. 91–93*).—Data are presented which show that the oriental mantid *T. angustipennis* has become established in southern New Jersey and has been collected at points in Delaware and the adjoining section of Maryland.

The biology of the greenhouse thrips (Heliothrips haemorrhoidalis Bouché) in Palestine, E. RIVNAY (*Hadar, 7 (1934), No. 11, pp. 241–246, figs. 7*).—These observations on the greenhouse thrips, made in citrus groves along the coastal plain, where it is occasionally a troublesome pest, are contributed from the agricultural experiment station at Rehovoth.

Chirothripoides dendropogonus, a new species of thrips of a family new to North America (Chirothripoididae: Thysanoptera), J. G. WATTS (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 542–544, figs. 4*).—Contributing from the South Carolina Experiment Station, the author describes a new thrips collected on Spanish moss at Beaufort, S. C., under the name *C. dendropogonus* n. sp. This is thought to be the first member of the family found on the North American Continent.

The bronze orange bug, W. A. T. SUMMERVILLE (*Queensland Agr. Jour., 43 (1935), No. 3, pp. 245–253, figs. 7*).—A summary of information on the biology and control of *Rhoecocoris* (*Oncoscelis*) *sulciventris* Stål, long an important enemy of citrus in Queensland.

A comparison of certain materials used as chinch bug barriers, L. L. HUBER and J. S. HOUSER (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 414–416, fig. 1*).—The results of a comparison made by the Ohio Experiment Station of the effectiveness of certain materials used by, or recommended to, farmers as chinch bug barriers in 1934 are reported upon.

Chinch bug barriers and repellents, W. P. FLINT, M. D. FARRAR, and W. E. MCCAULEY (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 410–414, fig. 1*).—This contribution presents tables (1) showing the viscosities of certain commercial and experimental creosotes used in Illinois in 1934, indicating the satisfactory range of viscosity, and (2) summarizing the results of tests of types of barriers and repellent materials.

The chinch bug, W. P. FLINT (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 333–341*).—A review of the chinch bug situation contributed from the Illinois Experiment Station.

Control of the common green capsid bug, with special reference to the use of tar-petroleum oil winter washes, M. D. AUSTIN, S. G. JARY, and H. MARTIN (*Jour. Min. Agr. [Gt. Brit.], 41 (1935), No. 12, pp. 1195–1205*).—The work reported shows that certain tar-distillate washes are highly toxic to the eggs of *Lygus pabulinus* L., known as the common green capsid bug, and that in Great Britain such washes may safely be applied to red and black currants up to the middle of February.

The ecological distribution of some South American froghoppers of the genus Tomaspis (Hem., Cercopidae), J. G. MYERS (*Trop. Agr. [Trinidad], 12 (1935), No. 5, pp. 114–118*).—Of 15 species of froghoppers of the genus *Tomaspis* studied ecologically during the search for parasites in Trinidad and from Venezuela to the Amazon, 6 frequently or occasionally attack sugarcane, especially when it is planted in the same stations as the plant associations to which they are primitively attached. While only 1, *T. saccharina* Dist., is relatively thoroughly and continuously adapted to cane field conditions, all are considered to be potential pests.

Hibernation studies of the potato leafhopper (Empoasca fabae Harris) and related species of Empoasca occurring in Ohio, D. M. DELONG and J. S. CALDWELL (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 442–444*).—The authors conclude that as specimens of the potato leaf hopper cannot be successfully hibernated nor found in hibernation, and no evidence can be obtained regarding the passing of the winter in the egg stage upon either wild or cultivated host, there is a strong possibility, in view of the late appearance in the spring of the adults in great abundance, that it passes the winter or survives only in areas of milder climate and migrates to Ohio and similar States as an adult. "The only evidence for this is the strong negative evidence presented in the other two possibilities, and the fact that they appear in cultivated fields exactly as other migrating leaf hoppers appear in other areas on economic crops. The migra-

tion flights are usually marked by the abrupt appearance of large numbers in cultivated fields and late in the season, apparently migrating from a breeding ground elsewhere.

"Material taken in Florida and in the Gulf States show definitely that *E. fabae* breeds in these areas on alfalfa and similar crops during the winter, and that the populations become quite large in March and April."

Immediate and residual effects of certain insecticides on the white apple leafhopper, H. M. STEINER (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 385–388*).—The results of work by the New York State Experiment Station in the Hudson Valley fruit district in 1934, aimed particularly at the determination of the residual effects of some of the more promising combinations when used as single spray treatments against second-brood nymphs, are reported upon, the details being given in two tables.

Nicotine sulfate in most of its combinations provided an effective residual action against the nymphs. The best immediate and residual kills were obtained with nicotine sulfate in combination with summer oil or soap. All soaps, with the exception of ammonium sulfo soap, gave a uniform immediate kill, but considerable differences occurred in residual kill, varying with the kind of soap and with the rate at which it was used. The residual kill obtained with the soaps and nicotine sulfate was consistently higher with all brands when the soap was used at a 0.5 to 100 rate than when used at a 3 to 100 rate.

Cutting treatments of alfalfa in relation to infestations of leafhoppers, L. F. GRABER and V. G. SPRAGUE (*Ecology, 16 (1935), No. 1, pp. 48–59, fig. 1*).—This is a more detailed report of leaf hopper control work at the Wisconsin Experiment Station than that previously noted (E. S. R., 71, p. 510).

Psyllid yellows of tomatoes and control of the psyllid, Paratrioza cockerelli Sulc, by the use of sulphur, G. M. LIST (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 431–436, figs. 3*).—In control work with *P. cockerelli* on tomatoes by the Colorado Experiment Station (E. S. R., 71, p. 671), lime-sulfur spray and sulfur dusts have had a distinct repelling effect upon the adults and a lethal effect upon the nymphs. Plants freed of the insect have shown a marked tendency to recover from psyllid yellows and given a marked increase in yield and quality of fruit.

The biology of the apple aphids in relation to fall spraying, T. W. REED (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 379–385, fig. 1*).—Studies by the New York State Experiment Station have shown the fall activities of the apple aphid, the rosy apple aphid, and the apple grain aphid to be independent of each other and the relative abundance of each species to vary considerably from year to year. The eggs of the apple aphid were found only on water sprouts and on young trees in the vicinity of late-surviving colonies of the summer forms. The eggs of the apple grain aphid are laid principally on the smaller branches in exposed situations and comprise the bulk of the eggs one sees on casual observation of dormant trees. The eggs of the rosy apple aphid are laid mainly on the larger branches in the vicinity of the fruit spurs, in cracks, and under rough bark where they are not readily observed.

"These aphids withstood a temperature of 10° F. but succumbed at a temperature of 7°. Egg laying and other activity cease at or below a temperature of about 40°. Control by defoliation was possible, but injury to the trees followed. Fall control by nicotine sprays was obtained, but such treatment is not practical. Mineral oil and cresylic acid applied in the fall of 1933 was highly injurious to the trees. This combination was less injurious when applied the following spring. It produced no harmful effects when it followed a mild winter. Tar lubricating oil sprays (65 percent tar oil, 15 percent lubricating oil) caused

no injury when applied during the falls of 1931 and 1932. When applied preceding the severe winter of 1933–34 the weaker dilutions appeared to be a little less injurious than when applied the following spring, but at the higher concentrations no difference was apparent. Tar oils applied either in the fall or spring were effective in controlling the rosy aphid."

Studies of the reactions of potato aphids to sprayed and unsprayed potato leaves, J. B. Moore (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 436–442, figs. 5*).—The experimental work reported has shown that the potato aphid does not increase in numbers when allowed to develop on plants sprayed with bordeaux mixture as compared with unsprayed plants under greenhouse conditions. A comparison of the number of aphids responding to light reflected from sprayed and unsprayed potato leaves showed that they were definitely attracted in larger numbers to the sprayed leaves under the conditions of the experiment. It was found that there was no difference in the wave lengths of the light reflected from sprayed and unsprayed leaf surfaces, but there was more intense light reflected from the sprayed leaf surface.

In a preliminary field experiment conducted using bordeaux mixture 5–5–50 alone and dyed with Fast Green, there was found to be a marked reduction in the numbers of aphids on plants sprayed with the dye combined with bordeaux mixture. There were, however, fewer aphids on unsprayed vines than on the dyed vines, indicating that the dye did not entirely mask the effects of the bordeaux.

Incubation period of pea mosaic in the aphid Macrosiphum pisi, H. T. Osborn (*Phytopathology, 25 (1935), No. 2, pp. 160–177, figs. 2*).—In presenting the results of experiments that demonstrate an incubation period of pea mosaic in the pea aphid, the author reports having found that the aphids which acquire the virus after feeding on diseased plants retain it for considerable periods of time, in one colony over a period of 29 days. The potato aphid also transmits the disease, but the bean aphid does not.

A new Myzus from Florida, A. N. Tissot (*Fla. Ent., 18 (1935), No. 4, pp. 49–52, figs. 7*).—Contributing from the Florida Experiment Station, the author presents a description of an aphid found on loquat, apple, and hawthorn at Gainesville, Fla., under the name *M. eriobotryae* n. sp.

A progress report on the insecticidal control of the Mexican mealybug (Phenacoccus gossypii T. and Ckll.) on greenhouse chrysanthemums, H. H. Richardson (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 399–405*).—*P. gossypii*, first recorded in California in 1917, has spread widely over most of the Southern and Central States and as far north as Michigan and New York, being particularly injurious to greenhouse chrysanthemums, where losses of 40 to 50 percent of this crop are not uncommon.

In the work reported "derris, pyrethrum, and tobacco dusts were ineffective for control. Sulfur dusts showed some promise, killing high percentages of the eggs. Various sprays at the concentrations tested differed in the following order from lesser to greater effectiveness: (1) Soap, (2) nicotine, (3) pyrethrum or derris, (4) organic thiocyanates, [and] (5) 10 percent kerosene emulsion. Lauryl and other thiocyanates killed a high percentage of eggs and exerted a residual toxic action for several days after spraying. Ordinary kerosene (43.4° B.) was more effective than a highly refined lighter-gravity kerosene (48.6° B.). The effectiveness of 5- or 10-percent kerosene emulsion did not differ much at 25, 100, 200, or 300 lb. pressure. Practical tests showed the 10 percent kerosene emulsion to be effective, and it was tolerated by a wide variety of chrysanthemums when applied as recommended. Hot-water dips and naphthalene or nicotine fumigations showed little promise.

"*P. gossypii* was much more susceptible to calcium cyanide fumigation than *Pseudococcus citri* or *P. maritimus*. Overnight exposures to dosages of $\frac{1}{16}$ to ⅝ oz. per 1,000 cu. ft. (depending on tightness of the greenhouse) gave high mortality and killed from 5 to 15 percent of the eggs. Three to six fumigations at weekly intervals gave good control. The stock plants, unrooted and rooted cuttings, growing plants, and plants in bloom of a wide variety of chrysanthemums have been fumigated safely where the recommended conditions have been maintained. Calcium cyanide fumigation is of course much more suitable from the standpoint of thoroughness, efficiency, cost, and ease of application than an effective spray."

Pineapple mealy-bug wilt in the Philippines, F. B. SERRANO (*Philippine Jour. Sci., 55 (1934), No. 4, pp. 363-377, pls. 5*).—Infestation experiments conducted have conclusively shown that pineapple mealybug wilt (1) occurs in the Philippine Islands wherever the Smooth Cayenne variety is grown, (2) appears to be identical with the wilt occurring in Haiti and Hawaii, and (3) is primarily and truly caused by the pineapple mealybug. This insect appears to secrete a nonliving toxic principle which causes the wilting of the plant and typical wilt symptoms in about 2 mo. The abundance and general vigor of the mealybug colonies seem to be greatly favored by two species of ants, namely, *Pheidole megacephala* (Fab.) and *Solenopsis geminata* Fab. var. *rufa* Jerdon. There are two strains of the pineapple mealybug, (1) the gray form which produces green spotting which is not an important characteristic of wilt though very common among quick-wilt cases; and (2) a pink form which produces chlorotic spots that are characteristic of the two types of wilt but more commonly met with in slow wilt.

Experiments in the control of two greenhouse mealybugs, Phenacoccus gossypii T. & Ckll. and Pseudococcus citri Risso, C. R. NEISWANDER (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 405-410, figs. 2*).—In control work by the Ohio Experiment Station with *P. gossypii*, Lethane No. 420, an aliphatic thiocyanate, was significantly superior to all other insecticides tested. In five applications to chrysanthemums in a commercial house at the rate of 1 to 400 with Penetrol 1 to 200, a reduction from the check of 99.1 percent in population and of 98 percent in the hatch of eggs was obtained. The application of Lethane No. 420 at a 1 to 800 dilution with soap 1 to 250 resulted in a reduction from the check of 99 percent of the live population of the citrus mealybug infesting *Coleus*; a similar reduction was obtained from the use of nicotine sulfate at 1 to 400 with Verdol at 1 to 200.

The campaign against Aspidiotus destructor Sign. in Fiji, T. H. C. TAYLOR (*Bul. Ent. Res., 26 (1935), No. 1, pp. 1-102, figs. 41*).—Brief accounts of the biology of *A. destructor*, its economic importance in Fiji prior to 1928 (pp. 8-11), and its natural control in Fiji prior to 1927 (pp. 11-17), the last two by R. W. Paine, are followed by reports on some natural enemies of and importation from Java and Trinidad. The contribution concludes with a brief consideration of the comparative value of parasites and predators as controlling factors of *A. destructor*.

Productivity of the camphor scale and the biology of its egg and crawler stages, C. I. BLISS, A. W. CRESSMAN, and B. M. BROADBENT (*Jour. Agr. Res. [U. S.], 50 (1935), No. 3, pp. 243-266, figs. 10*).—Studies of the productivity of the camphor scale and its biology from the time of egg deposition to the settling of the newly hatched nymphs, the period in which the maximum abundance of the succeeding generation is determined, are reported upon, the details being given in 12 tables.

Biology of the camphor scale and a method for predicting the time of appearance of stages in the field, A. W. Cressman, C. I. Bliss, L. T. Kessels, and J. O. Dumestre (*Jour. Agr. Res. [U. S.], 50 (1935), No. 3, pp. 267–283, figs. 7*).—The authors have found the rate of development of the camphor scale "to be dependent largely upon the mean temperature, the index of correlation between the length of the first stadium and the temperature being 0.98, and for the length of the second stadium, 0.96. Curves are given for the length of the first and second stadia, the period from the second molt to egg production, and the time from the first egg to appearance of newly settled nymphs, as functions of temperature.

"Of the females that settled on the stem, 88.9 percent completed the first stadium, 56.4 percent the second stadium, and 33.4 percent reproduced. Approximately equal numbers of males and females were produced, and fertilization was necessary to reproduction. The mean temperature from the date of emergence of the first brood was found to be a satisfactory basis for predicting the time of appearance of the different stages under field conditions, the calculated and observed dates for field counts extending over 3 yr. agreeing within the accuracy of the data. As many as 30 to 37 percent of the scales have been killed by low winter temperatures. Resistance to subfreezing temperatures was greatest when they were preceded by subnormal temperatures and when the scales were in the earlier stages of development.

"Parasites and predators have not been important factors in the control of this insect."

Eradication of prickly pear by cochineal insects in the Bombay Presidency, V. G. Deshpande (*Agr. and Livestock in India, 5 (1935), No. 1, pp. 36–42*).—A discussion of the eradication of pricklypear (*Opuntia* spp.) by the introduced mealybug *Dactylopius tomentosus* in the Bombay Presidency.

Host plant index of Indo-Ceylonese Coccidae, S. Ramachandran and T. V. Ramakrishna Ayyar (*Imp. Council Agr. Res. [India], Misc. Bul. 4 (1934), pp. [2]+113+X*).—In this index attempts have been made to record all of the known species of Coccidae that occur on various cultivated and wild plants in the Indo-Ceylonese region. A check list of the Coccidae of this region and a bulletin on the south Indian Coccidae have been noted (E. S. R., 47, p. 358; 64, p. 245).

The collection and analysis of data on the value of non-arsenical insecticides for the control of cabbage worms, G. M. List and L. Sweetman (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 298–304*).—In this contribution from the Colorado Experiment Station the application of Student's method of paired comparisons to a certain type of entomological problem is shown, the details of method and calculation being presented. It is concluded that in problems where numbers of samples must be small and opposing factors can be logically paired, this method can be used.

Larvicidal efficiency of certain spray combinations against the fruit tree leafroller, P. J. Chapman and R. W. Dean (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 376–379*).—Preliminary experiments conducted in 1934 at the New York State Experiment Station, in which a rather high control efficiency was obtained with certain spray combinations directed against the larvae of the fruit tree leaf roller, are reported.

The data obtained suggest that newly hatched fruit tree leaf roller larvae are readily poisoned with lead arsenate, but that in actual control operations the principal problem is to obtain and maintain adequate coverage of the surfaces where the larvae feed throughout the egg-hatching period. Presumably, the coverage properties needed are of the type supplied by the summer oil

emulsion used in these tests rather than by the casein or similar spreaders. Available evidence indicates that the oil itself contributed no appreciable insecticidal action. The egg masses on trees in these plats hatched normally, and although no plat received the summer oil alone, the results with it in combination with nicotine sulfate and cryolite suggest that this oil had little if any larvicidal value. The problem is complicated by the necessity of having to include a fungicide in leaf roller spray formulas.

Variations in seasonal prevalence of oriental fruit moth adults in peach and quince orchards, R. B. Neiswander (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 369–371, fig. 1*).—In a comparison made by the Ohio Experiment Station of the seasonal populations in quince and peach orchards, it was found that the oriental fruit moth prevalence "tends to shift from quince to peach in the early part of the season and from peach to quince as the fruit of the latter becomes suitable food material. Consequently, more larvae go into hibernation on or near quince trees. This may be interpreted to mean either that the attractiveness of quince foliage for oviposition changes during the summer or that larval mortality on quince trees is very high during the early part of the summer."

The effects of the cold winter of 1933–34 on the oriental fruit moth, G. G. Dustan (*Canad. Ent., 67 (1935), No. 4, pp. 65–68*).—The author's studies in 15 orchards in the Niagara Peninsula, Ont., in the winter of 1933–34, which was the coldest to which the oriental fruit moth has been exposed in Canada, failed to show that any marked reduction of the pest could be attributed to low temperatures. Its larval parasites, both native and liberated, also survived the winter.

1934 notes on baits for oriental fruit moth, S. W. Frost (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 366–369*).—A report is given of tests made of 40 different chemicals that were tested at the Pennsylvania Experiment Station for their efficiency in attracting the oriental fruit moth, the details being presented in tabular form. Twelve of the chemicals were outstandingly attractive to the oriental fruit moth, and 7 of these, in the order of their attractiveness, are linaloöl, safrole, propyl acetate, amyl acetate, anethole, terpinyl acetate, and furfural.

Non-economic insects as intermediate hosts of parasites of the oriental fruit moth, B. B. Pepper and B. F. Driggers (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 593–598*).—In this discussion of observations under way at the New Jersey Experiment Stations attention is directed to the importance of the so-called noneconomic species of insects living in weeds as the reservoir for native parasites that attack the oriental fruit moth. Reference is made to the finding in New Jersey of a 75 percent parasitism of the oriental fruit moth in an orchard having an extensive weed growth around the trees, as compared with 29 percent parasitism in orchards where clean cultivation was practiced.

Further work showing that paradichlorobenzene, naphthalene, and cedar oils are ineffective as repellents against clothes moths, W. S. Abbott and S. C. Billings (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 493–495*).—The authors present evidence to show that paradichlorobenzene, naphthalene, and cedar oils will not repel or drive away clothes moths.

The duration of moth protection by Eulan.—IV, Eulan AL, a Eulan suitable for application by the drycleaning process [trans. title], A. Hase (*Anz. Schädlingsk., 10 (1934), No. 11, pp. 123–134, figs. 6*).—This contribution (E. S. R., 70, p. 656) on the protection of woolen from the webbing clothes moth reports upon successful tests with Eulan AL, which is suitable for application with nonaqueous solutions.

Control of orange worms, A. F. Swain and R. P. Buckner (*Calif. Citrogr., 20 (1935), No. 5, pp. 144, 145, 146, 147, figs. 3*).—In experimental control work with the orange tortrix and *Holcocera iceryaeella* (Riley) on plats in a heavily infested Valencia grove in which the fruit was picked and processed separately, the application of barium fluosilicate as a spray and as a dust reduced the loss due to these worms from 26 percent on an untreated block to less than 10 percent where thoroughly applied and to approximately 14 percent where only an outside spray or dust was used. The spray consisted of 9 lb. of barium fluosilicate, 1 gal. of light-medium oil, and 12 oz. of dry spreader to 300 gal. of water. The dust plats were treated with 2 lb. of dust per tree applied by a standard fishtail duster. In one plat the dust consisted of 30 lb. of barium fluosilicate and 70 lb. of talc and in the other of 50 lb. each of barium fluosilicate and talc.

In this grove the average production per tree for the 1934 season was 711.6 fruit per tree, with a value of \$3.91 per tree. On the basis of the percentage of crop lost through worm injury, the average loss per tree was for the check plat \$1.016, thorough spray \$0.362, outside spray \$0.557, and dust \$0.538.

Strawberry leaf roller control by non-poisonous insecticides, R. Hutson (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 388–390*).—A report is made of control work with the strawberry leaf roller by the Michigan Experiment Station in the summer of 1933 in a field of everbearing strawberries that were heavily infested. It is pointed out that this pest is particularly destructive on everbearing strawberries, since the growth habit of the plant and the cultural practices followed are especially favorable to the growth and multiplication of the insect. Of the nonarsenical insecticides tested, pyrethrum dust was the most effective, followed by derris spray, and these insecticides used as dusts seemed to give the best control when used by growers in 1933. Pyrethrum and derris dusts gave a significantly better control than did pyrethrum sprays with and without spreading agents, while the result of spraying with ground derris plus a spreader gave control practically as good as dusts.

Control measures for the arbor vitae leaf miners, especially Recurvaria thujaëlla (Lepidoptera), A. E. Brower (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 397, 398*).—The experiments reported have shown that nicotine sulfate, 1 part to 400 parts of water, with soap or Penetrol may be expected to give a high percentage of control of the arbor vitae leaf miners (*R. thujaëlla, Argyresthia freyella*, and the arbor vitae leaf miner), if applied near the end of the oviposition period.

The European corn borer: Past, present, and future, J. J. Davis (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 324–333*).—The results of research work with the European corn borer to date, its distribution and economic importance, and future work, contributed from the Indiana Experiment Station, are considered.

Oviposition in the columbine borer (Papaipema purpurifascia (G. & R.)) and the iris borer (Macronoctua onusta Grt.), G. H. Griswold (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 545–549, figs. 2*).—The author finds that while the life history and many of the habits of the columbine borer and the iris borer are similar, they differ markedly in the manner in which they deposit their eggs, in the length of the oviposition period, and in the total number of eggs deposited. "The female columbine borer scatters her eggs singly and loosely on the surface of the ground, while the female of the iris borer carefully glues her eggs in clusters to some object that has a rough, folded, or crinkled surface. The female iris borer lays nearly twice as many eggs as does the female columbine borer, although the oviposition period is only about half that in the latter species."

***The biological control of the sugar-cane moth borer in the Leeward* Islands**, H. E. Box (*Trop. Agr. [Trinidad], 12 (1935), No. 4, pp. 89–96*).—In continuation of studies of the Cuban tachinid parasite *Lixophaga diatraeae* Towns. of the sugarcane borer (E. S. R., 70, p. 506), the author presents the results of rearing work and surveys in Antigua and St. Kitts in 1933 and 1934. The surveys have shown that the reduction in the sugarcane borer infestation in the two islands in 1934 to one-half that found during the preceding years for which data are obtainable is directly due to the introduction of this parasite.

An extract from a report on the present position of *L. diatraeae* in the Leeward Islands, made by J. G. Myers, is appended (pp. 94–96).

The effect of food plants on the development of the pale western cutworm (Agrotis orthogonia Morr.), H. L. SEAMANS and E. MCMILLAN (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 421–425*).—Observations of the development and of the direct and indirect effects of food plants on the larvae of the pale western cutworm are reported upon. This pest occurs over the greater part of the Great Plains area, normally feeding on the stems of grasses but in their absence turning its attention to a wide variety of plants and in Canada occurring on every field and garden crop and many of the common weeds. The larvae have also been found feeding on decaying straw or other vegetable matter after all green vegetation was destroyed.

Forecasting outbreaks of the pale western cutworm (Agrotis orthogonia Morr.), H. L. SEAMANS (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 425–428*).—The forecasting of outbreaks of the pale western cutworm, based on the "wet days" occurring during the period of larval activity, is said to have been attempted and verified for 11 yr. "These forecasts have been extremely accurate in predicting the relative abundance of the insect by localities over a very extensive area. At no time has a locality suffered from a severe infestation when the forecast predicted that cutworms would not be present. Farmers generally have been thoroughly convinced of the accuracy of the annual forecast and make free use of it in planning their season's operations." Control in Canada is effected by means of definite cultural practices designed to prevent the moths from ovipositing in certain fields during August and early September, thereby insuring cutworm-free land during the following crop year.

A survey of cutworm damage in a specimen locality in Saskatchewan, E. MCMILLAN (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 428–431, fig. 1*).—A survey of cutworm damage in Saskatchewan here reported upon has resulted in the accumulation of a mass of data with many leads for future investigations toward more sane cropping practices wherever the pale western cutworm is present.

Decline of the noctuid genus Papaipema (Lepidoptera), H. BIRD (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 551–556*).—A pronounced decline in the *Papaipema* fauna in the eastern United States and southern Canada is reported. This is said to be due primarily to the burning of waste lands and the resulting destruction of overwintering ova.

Lepidoptera that infest cultivated plants [trans. title], O. MONTE (*Bol. Agr., Zootech., e Vet. [Minas Geraes], 7 (1934), Nos. 3, pp. 145–165, figs. 28; 4, pp. 225–239, figs. 21; 5, pp. 267–277, pls. 2; 6, pp. 337–363, figs. 22; 7, pp. 33–47, figs. 18; 8, pp. 97–121, figs. 19; 9, pp. 193–213, figs. 15; 10, pp. 241–264, figs. 22; 11, pp. 321–331, figs. 9; 12, pp. 389–399, figs. 10*).—In this contribution from Minas Geraes, Brazil, a general account of the Lepidoptera is followed by descriptions of the forms of economic importance, their control, etc., arranged systematically.

Habitats of Philippine Anopheles larvae, P. F. RUSSELL and F. E. BAISAS (*Philippine Jour. Sci., 55 (1934), No. 4, pp. 297–306, pls. 5*).—A summary of

knowledge of the habitats of Philippine *Anopheles* larvae is presented with a list of 16 references to the literature.

A new Tabanus (Diptera) from Florida, G. B. FAIRCHILD (*Fla. Ent., 18 (1935), No. 4, pp. 53, 54*).—Contributing from the Florida Experiment Station, a description is given of *T. cayensis* n. sp., collected on Stock Island, near Key West, and Big Pine Key, both in Monroe County, Fla.

The egg-laying of the mourning horse-fly (Tabanus atratus Fab.), P. RAU (*Bul. Brooklyn Ent. Soc., 30 (1935), No. 1, p. 26, fig. 1*).—The author has found the larva of the black horsefly to be aquatic, the egg masses of this species having been observed placed on short twigs protruding above the water. Oviposition in the Mississippi River near St. Louis was observed to occur over a period of 5 weeks from July 27, 1930.

On the biology of the black fly Simulium ornatum Mg. (Diptera, Simuliidae), J. SMART (*Roy. Phys. Soc. [Edinb.], Proc., 22 (1933–34), No. 4, pp. 217–238, figs. 4*).—Studies of the biology of *S. ornatum* in Scotland here reported have shown that there are three generations a year, winter being passed in the larval stage. Six days are required for the incubation of the egg, and from 7 to 14 weeks during the summer and from 6 to 7 mo. during the winter for the larval stage. The pupal period was found to last from 4 to 12 days. Certain features of the larval anatomy and the spinning of the cocoon are described.

New blood-sucking flies from Utah (Simuliidae, Diptera), G. F. KNOWLTON and J. A. ROWE (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 580–584, figs. 10*).—Contributing from the Utah Experiment Station the authors present descriptions of four new species of simuliid flies from Utah under the names *Eusimulium pilosum*, *E. utahense*, *Simulium brevicercum*, and *S. nigresceum*.

Gasterophilus inermis Brauer, a species of horse bot not previously recorded from North America (Diptera: Oestridae), E. F. KNIPLING (*Ent. News, 46 (1935), No. 4, pp. 105–107*).—The infestation of horses at Rockford, Ill., by *Gastrophilus inermis*, a European form, is reported. This is thought to be the first record of the occurrence of the species in North America.

The larval stages of Hypoderma lineatum Devillers and Hypoderma bovis DeGeer, E. F. KNIPLING (*Jour. Parasitol., 21 (1935), No. 2, pp. 70–82*).—The author's observations indicate that the common cattle grub and the northern cattle grub pass through only three stages in their larval development, not four or five as previously supposed.

An outbreak of the screw worm Cochliomyia americana Cushing and Patton in northwestern Iowa, E. F. KNIPLING and H. D. TATE (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 472–475, fig. 1*).—A marked increase in the number of cases of screwworm infestation of domestic animals in Iowa in 1934 is reported in this contribution from the Iowa Experiment Station. On the basis of a survey that was conducted it appears that the outbreak occurred principally in Plymouth County and extended into Woodbury and parts of Monona and Cherokee Counties. Cattle, principally new-born calves, were the animals more often infested. Horses, sheep, hogs, dogs, and chickens were also infested in about the order named. This is considered to be the first authentic record of *C. americana* in Iowa and the first time from latitudes so far north.

Some notes on the biology and physiology of the sheep blowfly Lucilia sericata Meig., A. C. EVANS (*Bul. Ent. Res., 26 (1935), No. 1, pp. 115–122, figs. 5*).—In this contribution particular attention is given to the increase in weight of flies fed on various diets and histological changes during the growth period.

The larvae of Agromyzinae [trans. title], J. C. H. DE MEIJERE (*Tijdschr. Ent., 77 (1934), No. 3–4, pp. 244–290, figs. 33*).—A continuation of the account previously noted (E. S. R., 60, p. 653).

The asparagus miner (Melanagromyza simplex Löw) [trans. title], M. Dingler (*Anz. Schädlingsk.*, *10* (*1934*), *No. 12*, *pp. 135–139*, *figs. 2*).—A summary of knowledge of this enemy of asparagus presented in connection with a list of 11 references to the literature.

Ovicidal tests on certain dipterous eggs, with especial reference to the onion maggot (Hylemyia antiqua Meig.), J. P. Sleesman (*Jour. Econ. Ent.*, *28* (*1935*), *No. 2*, *pp. 453–457*).—In work at the Ohio Experiment Station "lubricating oil emulsions, when used alone and in combination with bordeaux mixture, were not toxic to the eggs of the onion maggot, the black onion fly [*Tritoxa flexa* Walk.] and the blowfly [*Sarcophaga sarraceniae* Riley]. Increasing the concentration of actual oil from 2 percent to 3 percent and to 6 percent did not increase the toxicity. Immersing the eggs of the black onion fly and of the blowfly in undiluted lubricating oil for periods up to 60 min. did not lower the rate of hatch."

Further experiments (1934) on the control of the cabbage root fly, E. E. Edwards (*Jour. Min. Agr.* [*Gt. Brit.*], *42* (*1935*), *No. 1*, *pp. 34–38*).—In field control experiments (E. S. R., 71, p. 819) with the cabbage root fly on cauliflower, three applications of corrosive sublimate 0.25 pt. per plant proved the most satisfactory, having consistently given good control. The use of weak solutions of tar distillate and magnesium sulfate gave highly promising results.

The relation of bacteria and bacterial filtrates to the development of mosquito larvae, L. E. Rozeboom (*Amer. Jour. Hyg.*, *21* (*1935*), *No. 1*, *pp. 167–179*).—In the studies reported upon, "no evidence could be found that solutes and colloids are a source of nutriment to mosquito larvae. Bacteria can be utilized as food by mosquito larvae to a certain extent. All kinds of bacteria are not equally suitable as food for mosquito larvae. When bacteria were the only source of food, the best development occurred in suspensions of environmental bacteria obtained from the natural breeding places of mosquitoes. *S*[*arcina*] *lutea* was of little value, while *E*[*scherichia*] *coli*, *B*[*acillus*] *subtilis*, *B. mycoides*, *A*[*erobacter*] *lactis-aerogenes*, and *P*[*seudomonas fluorescens* were about equally satisfactory. The larvae died rapidly in media contaminated with *P. pyocyaneus*. This was probably due to toxic products formed by this bacterium. The larvae of three species of *Culex* were found to be more exacting in their food requirements than were the *A*[*edes*] *aegypti* larvae.

"Attempts to grow mosquito larvae in the absence of bacteria were unsuccessful. Sterilization of the various media used in this investigation rendered the media unsatisfactory for the development of mosquito larvae. No larval development took place in an unheated, sterile blood medium. Contamination of any of these media with suitable bacteria rendered them satisfactory for the development of the mosquito larvae. No evidence could be found that the beneficial effects of bacteria in an otherwise unsuitable medium were due to either extra- or intra-cellular growth promoting factors, or to the action of proteolytic enzymes furnished by the bacteria."

Beauveria doryphorae n. sp., muscardine parasite of the Colorado potato beetle, Leptinotarsa decemlineata Say (Coleoptera: Chrysomelidae) [trans. title], R. Poisson and R. Patay (*Compt. Rend. Acad. Sci.* [*Paris*], *200* (*1935*), *No. 11*, *pp. 961–963*).—A fungus parasite of the adult and larval stages of the Colorado potato beetle observed in the environs of Rennes, France, is described as new under the name *B. doryphorae*.

Colorado beetle at Tilbury, II, J. C. F. Fryer (*Jour. Min. Agr.* [*Gt. Brit.*], *41* (*1935*), *No. 11*, *pp. 1058–1062*, *pl. 1*).—The occurrence and progress in eradication

of the Colorado potato beetle in England, where it was discovered at Tilbury in August 1933, are reported.

A new species of Phyllophaga from Florida (Coleop.: Scarabaeidae), O. L. Cartwright (*Ent. News, 46 (1935), No. 4, pp. 102–104, figs. 4*).—Contributing from the South Carolina Experiment Station, the author describes, under the name *P. youngi*, a new May beetle found feeding on the Florida *Trema*, *T. floridana* Britton, at Miami, Fla.

Derris and other insecticides for the control of the Mexican bean beetle, N. F. Howard, L. W. Brannon, and H. C. Mason (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 444–448*).—This account, which supplements that previously noted (E. S. R., 69, p. 84), deals with work conducted in 1933 and 1934. The results of experiments carried on in Ohio and in Virginia with some 13 insecticides are reported.

The performance of certain inorganic insecticide dusts in the control of cucumber beetles, H. F. Dietz and E. E. Zeisert (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 310–314*).—In work by a chemical company and the Ohio Experiment Station, cooperating, it was found that "the growth and yield of plants are not necessarily a measure of insecticidal efficiency and may be influenced by factors quite distinct from freedom of insect attack. The results measured as weight of fruit and total number of fruit do not necessarily coincide, and neither value by itself may be taken as a measure of insecticidal efficiency unless supported by other evidence of a more direct nature. When indirect methods of evaluating insecticidal performance are used, the variations between them are sufficiently great so that no one measure can be used alone and several must be considered collectively. Direct measurements, no matter how inadequate they may seem, should be taken and the results compared with those obtained by indirect methods. When the results of several methods are considered collectively, a number of treatments may group themselves as among the best, any one of which would give satisfactory commercial control."

The pecan tree borer in dogwood, G. W. Underhill (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 393–396*).—A severe infestation of 1- and 2-year-old pink dogwood trees in a nursery in Virginia by ***Synanthedon scitula*** Harris is recorded. The infestation increased from the 15 to 19 percent of the older trees when first observed in June 1931 to 30 percent of the old trees and 8.5 percent of the isolated young stock in October 1932, and 40 percent of the old stock in 1933. Young dogwood trees are attacked chiefly at the crown, but older trees may be infested in scars or in rough bark anywhere on the trunk or limbs.

Notes are presented on the biology of the borer and on its natural enemies, including six species of parasites reared from the larvae and pupae. Scouting in the woods indicated that the insect is quite generally distributed in native dogwood, although the infestation is light.

On the chemical changes associated with metamorphosis in a beetle (Tenebrio molitor L.), A. C. Evans (*Jour. Expt. Biol., 11 (1934), No. 4, pp. 397–401*).—In this contribution the changes in carbohydrate, fatty acids, unsaponifiable matter, and nitrogen distribution are described in detail during the metamorphosis from larva to adult in the yellow meal worm, and compared with those occurring in ***Lucilia sericata*** Meig.

The toxicity of carbon dioxide-methyl formate mixtures to the confused flour beetle (Tribolium confusum Duv.), R. M. Jones (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 475–485, figs. 3*).—This contribution, presented with a list of 33 references to the literature, gives data on the toxicity of atmospheres containing 50, 75, and 100 percent of CO_2 to the confused flour beetle.

"Evidence is also presented to show that the toxicity of a given concentration of CO_2 (between 50 and 100 percent) may be markedly increased by the

addition of small quantities of methyl formate. The results obtained by the addition of this chemical (at the rate of 5 mg/l) to the various percentages of CO_2 are as follows: (1) All of the beetles are killed in 4 hr. with 100 percent CO_2 plus methyl formate, as compared with 10 hr. for 100 percent CO_2 alone; (2) a complete kill in 6 hr. with atmospheres containing 75 percent CO_2 plus methyl formate, as compared with the 20 hr. required for the 75 percent CO_2-25 percent air mixtures alone; and (3) a 100 percent mortality in 8 hr. with atmospheres containing 50 percent CO_2 plus methyl formate, as compared with the 44-hr. required for the 50 percent CO_2-50 percent air mixtures without the methyl formate. When methyl formate is added at the rate of 10 mg/l to the atmospheres containing 50 percent of CO_2, the beetles are killed in a period of only 4 hr., as compared with 8 hr. when 5 mg/l are added.

"Additional data are included on the toxicity of atmospheres of 50 percent CO_2 plus methyl formate to the egg and larval stages of the above insect. All of the larvae are killed with an exposure of 3 hr., whereas 6 hr. are required to effect a complete kill of the eggs."

The control of flea beetles with a naphthalene-silica dust, H. W. Miles (*Jour. Min. Agr. [Gt. Brit.], 41 (1935), No. 11, pp. 1079–1083, pls. 2*).—Experiments conducted under field conditions in northwestern England "have shown that a naphthalene-silica dust, applied at the rate of about 55 lb. per acre at the time seedlings of swedes and other brassicae are breaking through the soil, will give adequate protection against flea beetles. Though early application is to be recommended in order to obtain the best results, some benefits may be obtained by later dustings and sufficient plants saved to render reseeding unnecessary. Application of the dust by means of a knapsack duster appears quite practical, and under normal conditions two men can dust an acre in about an hour and a half."

The control of flea beetles in seed-beds, F. R. Petherbridge and I. Thomas (*Jour. Min. Agr.* [*Gt. Brit.*], *41 (1935), No. 11, pp. 1070–1078, pl. 1*).—In control experiments conducted with flea beetles on cultivated crucifers, the authors have found the medium and light derris dusts to give the best results. Dusts, such as hydrated lime, are useful if applied frequently and in large quantities. Nicotine dust has given fair results, but is much more expensive. Naphthalene is useful if applied before the plants come through the ground to prevent the early underground attack, which is sometimes very severe.

The entomological phases of the Dutch elm disease, P. A. Readio (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 341–353, figs. 2*).—A discussion of the Dutch elm disease problem, particularly as relates to bark beetles of the genus *Scolytus* and their role in its spread. The account is accompanied by a list of 44 references to the literature.

Effects of constant light, temperature, and humidity on the rate and total amount of oviposition of the bean weevil (Bruchus obtectus Say), H. Menusan, Jr. (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 448–453, figs. 3*).—In a study of the factors affecting the oviposition of the bean weevil, a constant white light was found to reduce the number of eggs deposited by the weevils, the reduction being proportional to the light intensity. "Temperature has a marked effect on both the time required for oviposition and the rate at which the eggs are deposited. The lower the constant temperature, from 40° to 13° C., the longer the oviposition period. The greatest number of eggs are deposited by females at 24°, while the females at 27° have the highest rate of egg deposition. Few eggs were laid at 40° and none were deposited at 8.7°. The humidity of the environment did not appreciably affect the time required for oviposition. The greatest number of eggs were deposited by females at 90

percent relative humidity. At low humidities (1 to 25 percent r. h.) fewer eggs were laid than at higher humidities."

Effects of temperature and humidity on the life processes of the bean weevil (Bruchus obtectus Say), H. MENUSAN, JR. (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 515–526, figs. 3*).—A description is given of a method of evaluating the effects of temperature and humidity as environmental factors, in which the duration and viability of different stages of the bean weevil were used.

The alfalfa snout beetle Brachyrhinus ligustici L., a new insect pest in New York State, P. W. CLAASSEN and C. E. PALM (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 417–420*).—Notes are presented on the life history and behavior of *B. ligustici*, a serious pest of alfalfa and clover in Europe which, first collected in 1896, has become established in New York State in the vicinity of Oswego and bordering areas along the southern and eastern shores of Lake Ontario. It has completely destroyed entire alfalfa fields on several farms and caused severe injury to many other fields.

The adults emerge from their resting cells in the ground in the early spring, feed on the foliage of various plants, and migrate in search of larval host plants. Fortunately the adults cannot fly, for the hind wings are not developed and the wing covers are sealed on top of the body. However, the beetles are good crawlers and are capable of traveling considerable distances on foot. "Egg laying begins late in May and continues through most of July. The beetles are parthenogenetic and deposit an average of over 300 eggs each. Larvae hatch approximately 2 weeks after the eggs are laid. Their feeding injury to the root systems of alfalfa and other hosts often kills the plants outright. Mature larvae overwinter in the soil and pupate the following June and July. The newly formed adults remain inactive in the old pupal cells until the following spring, emerging 2 yr. after the eggs are laid."

Control of the plum curculio in Delaware, L. A. STEARNS, L. L. WILLIAMS, and W. R. HADEN (*Delaware Sta. Bul. 193 (1935), pp. 28, figs. 9*).—In continuation of studies of the plum curculio as an enemy of peach, the results of biological work with which from April 1928 to April 1930 by Dozier, Williams, and Butler having been noted (E. S. R., 67, p. 439), the authors report upon subsequent information of similar character, secured during 1930, 1931, and 1932, and the practical considerations involved in its effective control, the details being given in table and chart form.

The proof that during recent years two broods of this curculio have developed annually in southern Delaware, whereas in central and northern Delaware but a single brood is the normal occurrence, is said to be, from the control standpoint, the most important fact disclosed by the investigation. This marked variation in the seasonal life history of the curculio within the State is considered to have been in large measure responsible for the severity of the infestation and the unusual control difficulties encountered in the Bridgeville district in Sussex County. Knowledge of such variation led to the adaptation of control measures to local conditions, the efficiency of which had already been established in peach-growing areas in the South, where growers are continually faced with a similar control problem.

The peach spray program as revised and now recommended includes "three applications, the petal fall spray (applied when the majority of the petals have dropped), the shuck spray (applied when one-half of the peach is exposed by the slipping of the shuck), and the first cover spray (applied 2 weeks later), all of which are essential for control of this insect. They are especially designed to combat the activity of the adult curculios as they emerge from hibernation.

First emergence usually occurs shortly before the date of application of the petal fall spray, and overwintered adults are most active during the period in which protection is provided by the shuck and first cover sprays. The specific dates for the application of these sprays will vary somewhat from year to year due to the fact that the curculio is highly responsive to climatic fluctuations, particularly those in temperature. Dry lead arsenate (2 lb.) and hydrated lime (8 lb.) per 100 gal. of water should be used in all of them. Timeliness and thoroughness are of the utmost importance for effective results. The same program is equally applicable throughout the State. In years with a short peach crop, serious injury to apple can be prevented by the inclusion of dry lead arsenate (3 lb. per 100 gal. of water) in the preblossom and petal fall applications of the recommended spray program for that fruit."

It is thought that in southern Delaware spraying alone, as recommended for peaches, will not be sufficient, and that peach growers must resort to various supplementary measures to produce a crop free from curculio injury.

"There is conclusive evidence that this insect is most abundant and that the greatest losses are suffered along that edge of the orchard nearest the area affording the most favorable quarters for hibernation. Such data form the basis for the advice, repeated annually, to burn over in February or March those areas adjoining peach orchards which apparently provide suitable cover for hibernation; they justify the recommendation for jarring during the period of maximum spring emergence; they emphasize the necessity of intensive spraying of the five marginal rows of an orchard and suggest the desirability of spraying that section of the orchard first, provided there be some delay in application to the entire orchard; and, finally, they designate clearly the orchard area in which the practice of picking up infested peach drops will produce maximum results.

"The last-mentioned operation is, without question, the most important of all. Infested drops should be picked up at least twice; first, during the last week in May, and, later, during the first week in June. Under severe conditions of infestation, a third collection should be made during the second week in June and the orchard should receive frequent and thorough disking throughout the remainder of that month. Burning, boiling, submergence in bags in water, and burial are possible effective methods for the disposal of such drops."

Man's winged ally, the busy honeybee, J. I. Hambleton (*Natl. Geogr. Mag., 67 (1935), No. 4, pp. 401–428, pls. 8, figs. 18*).—A practical account, illustrated by colored plates.

Effect of Argentine ant poison on the ant fauna of Mississippi, G. W. Haug (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 621–632, figs. 5*).—The author concludes from an examination of 6 acres of soil surface for ant nests, at the rate of 28 sq. ft. per minute, that although the Government Formula Argentine Ant Poison reduces the population of other ants this reduction is not sufficient to be of economic importance. "In Mississippi the bulk of any ant population is usually divided among only a few species, even though the population embraces many species. Sixty-three to 69 percent of the population in each plat examined, excepting 1, was divided among 3 species. In that exception 3 species made up 89 percent of the whole."

A summary of published information about Pharaoh's ant, with observations on the species in Kansas, R. C. Smith (*Kans. Acad. Sci. Trans., 37 (1934), pp. 139–149*).—This summary of information on Pharaoh's ant is contributed from the Kansas Experiment Station with a list of 27 references to the literature.

The biology of the thatching ant, Formica rufa obscuripes Forel, in North Dakota, N. A. Weber (*Ecol. Monog., 5 (1935), No. 2, pp. 165–206, figs. 6*).—

The thatching ant, studies of the biology of which are here reported, is a widespread species of western North America, ranging from Illinois to the Pacific Coast States and from the western Canadian Provinces to Texas. The author found it to occur throughout North Dakota from the Red River Valley to the Badlands. The natural food is derived mostly from (1) insects, and (2) aphid secretions. "Not the slightest evidence was found to suggest that this ant might use plants as food. Orthoptera formed about 26 percent of all insects taken, Lepidoptera about 22 percent, Coleoptera about 17 percent, Hemiptera and Homoptera about 12 percent each, Diptera about 9 percent, and Hymenoptera about 7 percent. Among the insects collected by the ants are such injurious forms as grasshoppers and leaf hoppers. Three species of ants used as food were collected—females and a worker of *Lasius niger* var. *neoniger* Emery, workers of *L. umbratus mixtus* var. *aphidicola* Walsh, and a male and parts of workers of *Myrmica scabrinodis sabuleti* var. *americana* Weber (MS).

"The aphid *Aphis symphoricarpi* Thos. is tended by *obscuripes*, generally when on the wolfberry, *Symphoricarpos occidentalis* Hook. The aphid *Neothasmia populicola* (Thos.) is tended by *obscuripes* on *Populus tremuloides* Michx.; another aphid, *Bipersona* sp., is similarly tended on sagebrush, *Artemesia* spp. The secretions of the aphids probably constitute a very important source of food. The relations between the aphids and ants are apparently of mutual benefit, the ants affording some protection in return for food."

Notes on the biology and the developmental stages of Glypta rufiscutellaris Cress. (Ichneumonidae, Hymenoptera), a larval parasite of the oriental fruit moth, B. E. Montgomery (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 371–376, figs. 2*).—A report is made of a study conducted at Moorestown, N. J., of *G. rufiscutellaris*, one of the native parasites of stem-boring lepidopterous larvae that has accepted the oriental fruit moth as a host and in some localities appears to be the predominating parasite of this insect.

Notes on the native hosts of some oriental fruit moth parasites, W. L. Putman (*Canad. Ent., 67 (1935), No. 3, pp. 46–49*).—Notes are contributed on native hosts of oriental fruit moth parasites in Ontario.

Introduced parasites of the brown-tail and gipsy moths reared from native hosts, J. V. Schaffner, Jr. (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 585–592*).—The collection and rearing of large numbers of native larvae in a search for the parasites that have been imported to aid in controlling the brown-tail moth and the gypsy moth has resulted in the recovery of 5 of the 12 established species. It appears that 2 of these, namely, *Apanteles melanoscelus* Ratz. and *Compsilura concinnata* Meig., can exist in the United States independent of the host for which they were introduced. However, only *C. concinnata*, which requires alternate and hibernating hosts, has found a variety of suitable host species that have enabled it to disperse far beyond the limits of the infestation of the pests for which it was introduced.

Observations on certain Diatraea parasites of Brazil and British Guiana, L. C. Scaramuzza (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Conf., 7 (1933), pp. 60–64*).—Contributing from the Cuban Agricultural Experiment Station, the author reports upon observations made during the course of a trip through British Guiana to the lower Amazonas (Amazon) in Brazil during the summer of 1933 to study a new parasite of the sugarcane borer. Following brief mention of hymenopterous parasites of the genera *Bassus* (*Microdus*) and *Ipobracon*, reference is made to the dexid *Paratheresia claripalpis*, formerly known as *Sarcophaga diatraeae* Breth., and *P. signifera* Towns., the introduction of which into Cuba is recommended. Particular mention is made of another dexid, *Stomatodexia diadema* Wied., previously reported from Trinidad, Brit-

ish Guiana, and Surinam, which was found by the author to be abundant in Brazil as a parasite of the sugarcane borer. Reference is made to the observation that in the State of Amazonas, Brazil, the sugarcane borer shows a marked preference for the aquatic and semiaquatic grasses (*Paspalum repens* and *Echinochloa polystachya*), sugarcane growing nearby showing only slight attack.

Elasmus claripennis Cam., a hyper-parasite of lac insects, H. Mahdihassan (*Ann. Ent. Soc. America, 27 (1934), No. 4, pp. 509–514, figs. 5*).—In this contribution from British India, the author emphasizes the fact that *E. claripennis* has alternative hosts and that advantage may be taken of this to increase its numbers without at the same time increasing the number of the moth host *Eublemma amabilis* Moore, the caterpillars of which are a common enemy of lac insects.

Five new species of Braconidae with host records of additional species, G. S. Walley (*Canad. Ent., 67 (1935), No. 3, pp. 55–61*).—*Earinus zeirapherae*, reared from *Zeiraphera ratzeburgiana* Sax., and *Microgaster peroneae*, reared from *Peronea variana*, both in Nova Scotia; *M. leechi*, reared from *Pyrausta perte xtalis* Led., in British Columbia; *Microbracon laspeyresiae*, reared from the hickory shuck worm, in Ontario; and *Apanteles solenobiae*, reared from *Solenobia walshella* Clem., in Quebec and Ontario are described as new.

Morphology and biology of the wheat jointworm gall, W. J. Phillips and F. F. Dicke (*Jour. Agr. Res. [U. S.], 50 (1935), No. 4, pp. 359–386, figs. 13*).—The authors' study of the gall development in wheat stems following attack by the wheat jointworm indicates that the absence of the insect from the Kansas and western Missouri wheat fields is due to the character of the stem in wheat grown in that immense district. Following a brief introduction, historical résumé, and methods and procedure, the authors report upon a study of oviposition, including deposition of the egg, factors influencing oviposition and their relationship to control measures, comparison of the meristematic regions of wheat produced in Kansas, Indiana, and Virginia as related to oviposition, and the effect of oviposition on the plant and spacing of the larvae in the internode; seasonal history of the gall; microchemical tests; zones in gall tissue; and the gall stimulus. A list of 13 references to the literature is included.

The black grain-stem sawfly, Trachelus tabidus (Fab.), in Ohio, J. S. Houser (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 457, 458*).—This contribution from the Ohio Experiment Station refers to the occurrence of *T. tabidus* in that State, as previously noted (E. S. R., 72, p. 233).

Studies of the grain straw fly Chlorops pumilionis Bjerk. [trans. title], A. Krasucki (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 14 (1933), No. 211, pp. 1–86, pls. [5], figs. 6; Ger. abs., pp. 70–86*).—Studies of the biology of *C. pumilionis* (*C. taeniopus* Meig.), the details of which are given in tabular form, are presented with a list of 88 references to the literature.

Some poisonous arthropods of southwestern Mexico (Chilopoda and Arachnida), W. J. Baerg (*Ann. Ent. Soc. Amer., 27 (1934), No. 4, pp. 527–532*).—The author has found two scorpions, *Centruroides elegans* and *C. limpidus*, to be dangerously poisonous. Mention is made of other forms known to have similar poisonous effects.

Factors relating to the control of the mushroom mite Histiostoma gracilipes Banks, C. C. Compton (*Jour. Econ. Ent., 28 (1935), No. 2, pp. 465–468*).—Factors relating to the control of the mushroom mite *H. gracilipes*, which has been found more generally destructive to mushrooms than either *Tyroglyphus lintneri* Osborn or *Linopodes antennaepes* Banks, are dealt with. This mite,

which is most destructive to the spawn as it is running through the beds, although it feeds on all stages of the developing caps, is said to have caused losses in excess of $25,000 annually over a 3-yr. period to one Illinois grower.

Life-history of a water-mite parasitic on Anopheles, T. UCHIDA and I. MIYAZAKI (*Imp. Acad. [Japan], Proc., 11 (1935), No. 2, pp. 73–76, fig. 1*).—This contribution, which relates to a water mite apparently identical with *Arrhenurus madarászi* Daday, is thought to have been described under five names. It is commonly found in rice fields and pools, where it searches after and is parasitic on the pupae of *Anopheles* and *Culex*.

The life history of the Australian cattle tick under Philippine conditions, Z. DE JESUS (*Philippine Jour. Anim. Indus., 1 (1934), No. 6, pp. 355–369, pls. 2, fig. 1*).—It was found that under Philippine conditions the life cycle of *Boophilus australis* Fuller is completed in from 48.5 days in the dry season to 50.5 days in the wet season, or in an average of 49.5 days. Of the 49.5 days representing the period covered by the life cycle, 28 days are spent on the ground and 21.5 days on the host. "The period elapsing from the time the engorged gravid females drop to the ground to the time the seed ticks swarm on the top leaves of grasses is from 28 to 29 days in the wet season and from 26 to 29 days in the dry season, giving an average of 28.66 days for the wet season and 27.66 days for the dry season. In the absence of a natural host, the larvae can remain viable on the leaves of pasture vegetation for from 84 to 98 days. While cattle are the usual natural hosts of the *B. australis*, the carabao, horse, and goat can act also as natural hosts of this arachnid." The seed ticks do not bite man, but the nymphs attach themselves readily to the human skin and become engorged with blood.

The ticks of rodents and their nests, and the discovery that Rhipicephalus sanguineus Latr. is the vector of tropical typhus in Kenya, J. I. ROBERTS (*Jour. Hyg. [London], 35 (1935), No. 1, pp. 1–22*).—Evidence is presented to show that the brown dog tick, which in Nairobi in the absence of its usual host attacks man, may be a vector of tropical typhus.

ANIMAL PRODUCTION

A compilation of experimental and other data on planning the feeding of farm animals, compiled by C. F. CLARK (*Mississippi Sta. Bul. 304 (1935), pp. [2]+61, figs. 3*).—Based on experimental work at this and other experiment stations, recommendations are given to assist in determining economical practices to follow in feeding work stock and dairy cattle, and methods are suggested for the individual farm so that an adequate supply of feed needed for these animals may be produced.

An adaptation of the "randomized block" to nutrition experiments, H. W. TITUS and H. M. HARSHAW (*Poultry Sci., 14 (1935), No. 1, pp. 3–15, fig. 1*).—This paper from the U. S. D. A. Bureau of Animal Industry (E. S. R., 73, p. 85) demonstrates an adaptation of the randomized block to the planning and interpretation of nutrition experiments. It is shown how the effect of differences in initial live weight and in feed consumption, if the animals are individually fed, may be equalized or eliminated. The effect of other uncontrolled but measurable factors may be eliminated also by this method. The methods described are of general application and may be used in other types of experiments with animals.

Effect of temperature of artificial drying on digestibility and availability of nutrients in pasture herbage, R. E. HODGSON, J. C. KNOTT, R. R. GRAVES, and H. K. MURER (*Jour. Agr. Res. [U. S.], 50 (1935), No. 2, pp. 149–164, figs. 4*).—Six digestion and mineral balance trials were conducted at the Wash-

ington Experiment Station in cooperation with the U. S. D. A. Bureau of Dairy Industry to determine the effect of the temperature of artificial drying on the apparent digestibility and availability of the feed nutrients in a 3-week-old mixed pasture grass, consisting of English ryegrass, Italian ryegrass, and white clover 40:40:20. The grass, dried at exhaust-gas temperatures of 250°, 300°, 350°, and 400° F., was fed to yearling wethers as the sole ration for periods of 21 days.

There was no significant difference in the percentage of apparent digestibility at the three lower drying temperatures when compared with sun-cured grass. The percentage of apparent digestibility for these grasses averaged 76 for dry matter, 76 for crude protein, 83 for crude fiber, 73 for ether extract, 83 for nitrogen-free extract, and 44 for ash. Drying at 400° had a depressing effect on the apparent digestibility of the crude protein, dry matter, and nitrogen-free extract. The apparent digestibility of dry matter, crude protein, crude fiber, and nitrogen-free extract was slightly lower for the green grass than for the dried samples with the exception of that dried at 400°. Positive balances of nitrogen, calcium, and phosphorus were maintained by the sheep receiving the different rations, and there was no apparent relationship between the average nitrogen balance and the temperature of drying. In this test the percentage of natural color of the grass was highest in sun-cured samples, and decreased as the temperature of drying increased from 250° to 400°. On the basis of the feeding test, artificial drying at 400° was an uneconomical practice. The most efficient temperature with the machine used was from 300° to 350°. It was apparent that the digestibility of the nutrients in the grass was influenced not only by the temperature but by the length of time during which it is subjected to relatively high temperatures.

The disposal of sugar beet by-products, [I, II], F. Rayns (*Jour. Roy. Agr. Soc. England, 93 (1932), pp. 214–232, fig. 1; 94 (1933), pp. 151–160*).—These studies were carried on at the Norfolk Agricultural Station.

[I.] *Bullock feeding on sugar beet tops.*—A series of four trials involving 79 fattening bullocks were undertaken to compare beet tops with theoretically equivalent amounts of swedes.

Beet tops did not produce as much gain on the same amount of feed as did swedes. Bullocks fed for 80 days on beet tops and finished on roots made larger gains after top feeding ceased than did those fed continuously on roots, but never attained the total gain made by the root-fed animals. Beet top feeding had no noticeable effect on the carcass, and there was no difference in the dressing percentage of the two groups. The feeding value of beet tops varied, depending upon the cultural practices followed in the production of the beets. Feeding 2 oz. of chalk per animal per day overcame the tendency for beet tops to cause scouring. On an acre basis beet tops produced enough feed to fatten about one-half as many animals as an acre of roots.

[II.] *Sheep fattening on sugar beet tops.*—Results of 3 years' comparisons of the feeding value of sugar beet tops and of swedes for sheep are reported. When fed in rations having equivalent feeding values, beet tops were not equal to swedes. The average live weight increase per sheep per week was 2.7 lb. on swedes and 1.9 lb. on beet tops. It is concluded, however, that beet tops are a valuable feed for sheep, and that for all practical purposes 1 ton of beet tops is equal to 1 ton of swedes.

Ergot as a factor in the nutritive value of rye for rats and swine, D. W. Johnson and L. S. Palmer (*Jour. Agr. Res. [U. S.], 50 (1935), No. 1, pp. 39–45, fig. 1*).—Continuing the study of rye (E. S. R., 72, p. 88) at the Minnesota Experiment Station, the possibilities that the presence of even small amounts of

ergot may influence the palatability of rye were investigated with both rats and swine.

In a paired-feeding test with swine in which the controls received a rye basal diet and the experimental pigs the same diet with 1 percent of rye replaced by ergot, the ergot retarded growth to a statistically significant degree. In the swine tests ergot did not lose its distastefulness even after 1 yr. in storage.

With rats the rye diet containing ergot was so unpalatable that in the paired-feeding tests some of the controls as well as experimental animals had died of starvation by the end of 6 weeks. Although the control diet was more palatable than the ergotized diet, the food intake was so low that there was little difference in the growth rate of pairs. Liver meal, which greatly increased consumption of the rye basal diet, did not overcome the apparent unpalatability of the diets containing ergot. Ergot appeared to vary considerably in the content of the principles that caused distastefulness. There was little difference in the food consumption and growth of rats receiving rye and ergot diets and those receiving corn and ergot diets.

The gross symptoms of ergotism did not appear in any of the experimental animals, and it appeared that there was little danger of the disease occurring in swine due to their pronounced distaste for feeds infected with the fungus.

Beef cattle investigations, 1934–35 (*Kansas Sta., Fort Hays Substa., Beef Cattle Invest., 1934–35, pp. 8*).—The results of a number of experiments in the feeding of cattle are reported (E. S. R., 71, p. 520). Analyses are included of the various roughages tested.

Ground Russian-thistle hay alone v. ground Russian-thistle hay plus 1 lb. of cottonseed cake per head daily.—In this test it was found that ground Russian-thistle hay processed when more or less mature and supplemented with 1 lb. of cottonseed cake per head daily brought calves through the winter in a satisfactory condition. When fed alone, however, this hay was not a satisfactory wintering ration for stock cattle.

Ground Russian-thistle hay and cottonseed cake v. Russian-thistle silage and cottonseed cake.—Ground Russian-thistle hay supplemented with cottonseed cake proved to be more satisfactory as a wintering ration than Russian-thistle silage similarly supplemented. No appreciable benefit was derived from adding 2 bu. of ground shelled corn per ton of the silage.

Russian-thistle silage v. Russian-thistle kafir fodder silage.—Kafir fodder silage produced more than twice as much gain as silage made from kafir fodder and Russian-thistle hay, half and half. The latter feed, however, produced nearly twice as much gain as straight Russian-thistle silage.

Ground Russian-thistle hay as a partial substitute for kafir silage.—Ground Russian-thistle hay could be used to replace nearly one-half of a full kafir silage allowance without reducing gains materially, and the combination proved to be a very satisfactory winter ration for stock cattle.

Ground Russian-thistle hay v. kafir or Atlas sorgo hay.—Kafir hay and Atlas sorgo hay supplemented with cottonseed cake produced approximately 30 percent more gain than ground Russian-thistle hay supplemented with cake.

Kafir silage v. Atlas sorgo silage.—Both kafir silage and Atlas sorgo silage, when supplemented with cottonseed cake, were highly satisfactory as a wintering ration for calves, but the Atlas sorgo silage produced about 33 percent more gain than kafir silage.

Kafir silage v. kafir hay.—Kafir silage proved to be approximately 25 percent more efficient than kafir hay for wintering calves when both were supplemented with cottonseed cake.

Atlas sorgo silage v. Atlas sorgo hay.—Atlas sorgo silage produced 61 percent more gain than Atlas sorgo hay when both were supplemented with cottonseed cake.

Kafir hay v. Atlas sorgo hay.—There was no significant difference in the gains produced by kafir hay and Atlas sorgo hay.

Ground Russian-thistle hay plus blackstrap molasses v. ground Russian-thistle hay plus blackstrap molasses plus cottonseed cake.—Ground Russian-thistle hay plus 4 lb. of blackstrap molasses per head daily was a better ration than ground Russian-thistle hay alone, but the molasses was not so good a supplement for the hay as 1 lb. of cottonseed cake. The Russian-thistle hay, supplemented with both molasses and cottonseed cake, was an excellent stock cattle wintering ration. Russian-thistle hay plus molasses was a better ration than Russian-thistle silage supplemented with cottonseed cake.

Cottonseed meal as a supplement to pasture for fattening steers in the Black Belt of Alabama, J. C. Grimes, W. E. Sewell, and G. J. Cottier (*Alabama Sta. Circ. 72 (1935), pp. 11*).—In this test 2 lots of 2-year-old steers were run on pasture for a period averaging 84 days each year for 6 yr. In addition to the pasture, 1 lot received an average allowance of 4.7 lb. of cottonseed meal per head daily. During the last 3 yr. of the test a third lot was grazed on pasture for an average of 154 days per year without supplement.

In the first phase the steers receiving cottonseed meal made average daily gains of 2.5 lb. per head as compared with 1.9 lb. for the steers on grass alone. Charging pasture at 50 ct. per head for each 4-week period and cottonseed meal at $32.50 per ton made the cost per 100 lb. of gain $3.76 and 98 ct. in the respective lots. The steers fed cottonseed meal, in addition to making more gain, sold for 65 ct. more per hundredweight and returned a profit of $2.32 more per head than the steers on grass alone. During 5 of the 6 yr. it was profitable to feed the meal. With grass-fat cattle at 5 ct. per pound, cottonseed meal fed on pasture was worth $38.75 per ton.

During the last 3 yr. steers receiving cottonseed meal made average daily gains of 2.4 lb. per head during a 90-day period, while those on grass alone gained 1.7 lb. during 154 days. With pastnre at 50 ct. per head for 4 weeks and cottonseed meal at $25 per ton, the cost per 100 lb. of gain was $3.26 and $1.07 in the respective lots. In 2 of the 3 tests it was more profitable to fatten on grass alone and sell in September than to feed cottonseed meal on grass and sell in July.

Cane molasses as a cattle feed, S. Labh Singh and S. Gambhir Singh (*Agr. and Livestock in India, 4 (1934), No. 2, pp. 156–175*).—In tests with bullocks at the Punjab Agricultural College, 2 lb. of molasses successfully replaced 2 lb. of corn and 0.9 lb. of mixed roughages. An additional 2 lb. of molasses replaced only 2.5 lb. of mixed roughages. This was believed to be due to the depressing effect of the extra molasses on the digestibility of the basal ration. No harmful effects were noted that could be traced to the molasses feeding.

In a practical test bullocks fed molasses without access to salt developed a flow of frothy saliva from the mouth. On allowing the animals free access to salt this condition disappeared and did not recur.

Molasses at the rate of 1 lb. per cow per day was used to replace 1 lb. of wheat bran in a mixed ration without affecting the quantity and quality of milk produced.

Effect of winter feeding upon development of ewe lambs, W. F. Dickson and F. Barnum (*Natl. Wool Grower, 24 (1934), No. 11, pp. 20–22*).—At the Montana Experiment Station ewe lambs fed on a low plane of nutrition ate

272.7 lb. of oat hay and gained an average of 4.1 lb. each during a 112-day feeding period. Similar lambs in a full-fed lot ate 179.2 lb. each of oat and alfalfa hay and made an average gain of 16.8 lb. per head during the same period. As yearlings the limited-fed ewes gained 33.8 lb. per head on grass, while the full-fed ewes gained 24.3 lb.

In the limited-fed group of ewe lambs the lightest ones gained more than twice as much as the heaviest lambs. This was thought to be due to feed consumption in relation to body weight. There was no appreciable difference in the gains of the light and heavy lambs in the full-fed lot. The heavier ewe lambs in both the limited and full-fed lots were better grown out as 2-year-olds than were the lighter lambs. In general, there appeared to be a progressive increase in the weight of the fleece with an increase in body weight. This was particularly true in the case of the lots fed on a high plane of nutrition.

Ground alfalfa and self-feeders for fattening lambs, A. E. DARLOW (*Natl. Wool Grower, 24 (1934), No. 11, pp. 23, 24*).—The results of two tests at the Oklahoma Experiment Station indicated that when $7 alfalfa and 45 ct. corn were to be fed free choice, the cutting or chopping of the hay would be profitable if it could be done for $1.93 per ton or less. When the hay and corn were to be hand-fed, chopping would be unprofitable if it cost more than 50 ct. per ton. Mixing ground hay and corn and self-feeding produced cheaper gains than any other method of feeding. Adding cottonseed meal to a ration of corn and alfalfa hay for fattening lambs was unnecessary.

Utilization of protein concentrates by the growing chick, F. E. MUSSEHL and C. W. ACKERSON (*Poultry Sci., 14 (1935), No. 2, pp. 119–121, figs. 2*).—A study of the biological value of simple and complex protein supplements was made at the Nebraska Experiment Station. One of the supplements used was made up of meat scrap and dried buttermilk 2:1; a second consisted of equal parts of meat scrap, dried buttermilk, fishmeal, and soybean oil meal; while the third supplement was composed of equal parts of meat scrap, dried buttermilk, fishmeal, soybean oil meal, linseed meal, and cottonseed meal. The differences in growth-promoting value were slight. It is concluded that a considerable variety of protein sources did not enhance the biological value of a supplement when fed with a basal ration containing at least four other sources of protein.

The effect of diet on liver cholesterol in chickens, W. M. SPERRY and V. A. STOYANOFF (*Jour. Nutr., 9 (1935), No. 2, pp. 157–161*).—The total, free, and combined cholesterol in the livers of chicks fed rations containing varying amounts of cholesterol were determined. It was found that chickens like mammals absorb cholesterol and deposit it in the liver, but differ from rats in depositing proportionately more free cholesterol. The occasional high cholesterol values found on diets low in cholesterol indicated a marked individual variation in ability to assimilate this sterol.

Studies on the growth factor in liver, O. L. KLINE, C. A. ELVEHJEM, J. A. KEENAN, and E. B. HART (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 107–118, fig. 1*).—In this paper from the Wisconsin Experiment Station, a nutritional factor essential for the normal growth of chicks on purified diets is described. The substance also caused an increased growth of from 30 to 40 percent during the first 6 weeks of chicks on natural grain rations. The factor was abundant in 10 percent of a water-extracted liver residue.

The factor was stable at its natural pH to the autoclaving temperature for 10 hr. and to dry heating at 120° [F.] for 6 days. However, it could be destroyed by autoclaving at pH 9 for 5 hr. at 15 lb. pressure. The factor was insoluble in water until after the liver had been mildly hydrolyzed with acid, and it was then somewhat soluble in *n*-butyl alcohol.

The similarity of this factor, essential to normal nutrition of chicks, to growth substances reported by other workers is discussed.

The effect of the thyroid on the formation of the hen's egg, V. S. Asmundson and P. Pinsky (*Poultry Sci., 14 (1935), No. 2, pp. 99–104, figs. 2*).—Continuing the study on the effects of feeding desiccated thyroid to the laying hen (E. S. R., 66, p. 860), the California Experiment Station found that when enough thyroid was fed to supply 1 mg of thyroid iodine per 1,750 g of body weight the weight of the egg yolk was reduced. The amount of albumin secreted was not affected by such feeding, but there was a slight but significant increase in the amount of shell. The growth rate of the ovum was reduced by thyroid feeding, as was also the weight of the bird. It is suggested that the thyroid may normally be responsible for some of the differences in secretory activity of the oviducts observed when eggs from different hens were compared.

Carotene and vitamin A requirements for White Leghorn chicks, W. O. Frohring and J. Wyeno (*Jour. Nutr., 8 (1934), No. 4, pp. 463–476, pl. 1, figs. 4*).—In this study with 612 day-old White Leghorn chicks it was found that the minimum vitamin A requirement of the chick was relatively high per unit of body weight as compared with the rat. The minimum vitamin A requirement for the chick at about 8 weeks of age was approximately 65 A. D. M. A. units per day. The possibilities of using chicks as test animals in vitamin A determinations are suggested. No cases of slipped tendon were observed in 792 White Leghorn chicks depleted in vitamin A but given an otherwise adequate diet.

The comparative vitamin D requirements of growing chicks, turkeys, and pheasants, F. D. Baird and D. J. Greene (*Poultry Sci., 14 (1935), No. 2, pp. 70–82, figs. 3*).—In this investigation it was established that the antirachitic requirements of turkeys and pheasants could be adequately met by feeding fortified cod-liver oil. Chickens required a minimum of approximately 18 units, turkeys 60 to 70 units, and pheasants 50 to 60 units (U. S. P.) vitamin D per 100 g of feed to 12 weeks of age. When the ration was complete in all other respects this amount of vitamin D produced average weights of 1,000, 1,900, and 600 g or better for the respective types of birds at 12 weeks of age.

Effect of vitamin D on production and some properties of eggs, H. W. Titus and R. B. Nestler (*Poultry Sci., 14 (1935), No. 2, pp. 90–98*).—In a series of four investigations undertaken by the U. S. D. A. Bureau of Animal Industry, different amounts of vitamin D in the form of cod-liver oil or viosterol were added to the ration of laying birds.

Differences were observed in egg production, egg weight, total weight of eggs produced, and hatchability that could be definitely attributed to the source and quantity of vitamin D in the diet. The larger quantities of cod-liver oil had a markedly deleterious effect on egg production and hatchability. There were also indications that the higher levels of vitamin D in the form of viosterol were harmful to hatchability. For strictly confined laying birds it is tentatively suggested that the optimum amounts of cod-liver oil lie between 1 and 2 percent of the diet, and that when viosterol furnishes the vitamin D 10 to 20 times as much of the vitamin must be fed.

The relation of the preen gland to rickets in the domestic fowl, H. R. Knowles, E. B. Hart, and J. G. Halpin (*Poultry Sci., 14 (1935), No. 1, pp. 33–36*).—In order to test whether there was any relation between the secretion of the preen gland and the metabolism of vitamin D, the Wisconsin Experiment Station conducted an experiment with four lots of 3-day-old White Leghorn chicks fed the same basal ration. In three lots preen glands were re-

moved when the chicks were 10 days old. The lots received varying amounts of irradiation or cod-liver oil.

The lots in which the preen glands were removed grew as well as the controls and developed skeletons with normal ash content. It was demonstrated that when a sufficient source of the antirachitic factor was furnished the preen gland was not necessary for calcium metabolism in the chick.

The effect of the hen's diet on the bone changes in rachitic chicks, B. E. Kline, C. A. Elvehjem, and J. G. Halpin (*Poultry Sci., 14 (1935), No. 2, pp. 116–118*).—In this study at the Wisconsin Experiment Station 8 lots of 35 hens each were fed the same basal ration to which was added varying amounts of vitamin D in the form of either cod-liver oil, sunshine, or sardine oil. The tibias of representative chicks from each group were analyzed at 1 day and at 1, 2, 3, and 4 weeks of age.

The results showed that within practical feeding limits the level of vitamin D in the hen's ration did not affect the ash percentage of the bones of the chicks hatched from eggs laid by these hens. Although the chicks exhibited a very low bone ash at 2 weeks of age, the greater spread between rachitic and nonrachitic chicks at 4 weeks of age suggested that this period was the best length of time for vitamin D assay.

Effect of supplementary iodine on reproduction in the fowl, E. A. Johnson, A. M. Pilkey, and A. W. Edson (*Poultry Sci., 14 (1935), No. 1, pp. 16–23, figs. 4*).—A total of 974 White Leghorn pullets was fed in six separate trials at the Minnesota Experiment Station to determine the effects of ingesting 1 mg of potassium iodide per bird per day. In still another trial one lot of pullets was fed potassium iodide at the rate of 3 mg per head daily and another lot 1 mg of potassium iodide per bird every third day. The feeding of iodine did not improve total egg production, fertility, hatchability, or adult mortality.

Iron and copper metabolism in the developing chick embryo, W. D. McFarlane and H. I. Milne (*Jour. Biol. Chem., 107 (1934), No. 1, pp. 309–319, figs. 2*).—Determinations were made at the University of Alberta on the daily changes in the iron and copper content of the livers and of the body tissue of chick embryos from the tenth day of incubation to hatching. It was found that the absolute amount of iron per liver increased steadily up to hatching time, while the copper content increased at approximately the same rate to the seventeenth day and then remained fairly constant. From 50 to 60 percent of the iron accumulated in the liver before hatching was not combined as hemoglobin, but was present as nonhematin iron. The percentage of copper and iron on a dry-weight basis decreased in the liver from the thirteenth to the twenty-first day in inverse ratio to the dry weight of the liver, while the percentage in the rest of body remained fairly constant. The proportion of total iron and copper concentrated in the liver decreased during the later stages of incubation.

These results are compared with embryonic metabolism of copper in the pig and in the human.

The variation in the calcium level of the blood of the domestic fowl, H. R. Knowles, E. B. Hart, and J. G. Halpin (*Poultry Sci., 14 (1935), No. 2, pp. 83–89*).—The daily variation in the level of blood calcium of the laying hen was investigated at the Wisconsin Experiment Station.

The level of calcium in the blood was found to vary from one oviposition to another. The maxima and minima were not constant even for the same bird. The period of low level corresponded to the time taken for shell deposition, while the period of high level corresponded to the absence of a fully formed egg in the shell gland. In one case a sample of blood taken from the uterine

artery and uterine vein during shell deposition showed a marked difference in the calcium level. Chickens exhibited a rapid and sudden response to subcutaneous injections of parathormone.

Marl for laying hens, G. D. BUCKNER, W. M. INSKO, JR., and J. H. MARTIN (*Poultry Sci., 14 (1935), No. 2, pp. 125, 126*).—To determine the value of various sources of calcium for laying hens three typical marls and a high-grade limestone were selected by the Kentucky Experiment Station. These supplements were fed to birds in an individual pen laying battery. There were no variations in the weight records of the individual hens that could be attributed to the mineral supplement. The feed consumption was approximately the same in all lots, showing that the marls did not influence consumption. There was no significant difference between the lots in egg production. During one period when a calcium carbonate supplement was not added to the basal ration of all lots the average weight of eggs and dry shells decreased, but when the marls and limestone were added to the ration the weight of eggshells increased.

Sexual differences in growth and utilization of feed in White Leghorn chicks, J. S. CARVER and M. HOUGAN (*Poultry Sci., 14 (1935), No. 2, pp. 118, 121, fig. 1*).—Tests were undertaken at the Washington Experiment Station to determine whether there were sexual differences in growth and utilization of feed in chicks. A lot of 100 day-old sexed White Leghorn pullets and a similar lot of cockerels were fed the same basal ration. For the first 3 weeks the growth of the two lots was practically the same, after which, however, the cockerels grew more rapidly. The average gain in body weight per week over an 8-week period was 68.7 g for pullets and 81.3 g for cockerels. After the first week the cockerels consumed slightly more feed than the pullets, but both sexes showed slightly decreasing feed efficiency. The authors feel that as a result of this study nutritional experiments with growing chicks would be more efficient if sexed day-old pullets and cockerels were used.

Reproductive ability and viability of progeny in relation to the age of sires and dams, M. A. JULL (*Poultry Sci., 14 (1935), No. 2, pp. 105–111*).—In this study by the U. S. D. A. Bureau of Animal Industry with White Leghorn and Rhode Island Red birds the results showed that sires that gave good results as cockerels gave similar results when bred as yearlings. The same was true of dams when bred as pullets, yearlings, 2-year-olds, and 3-year-olds. The number of laying pullets per dam alive at the end of the first laying year was determined largely by the average number of eggs laid during the breeding season by the dams of different ages.

Progeny of inbred and non-inbred Rhode Island Red males, F. A. HAYS (*Poultry Sci., 14 (1935), No. 2, pp. 122–125*).—At the Massachusetts Experiment Station a study of all the Rhode Island Reds bred for high fecundity during the period 1930–32 showed that in general the daughters of individual inbred males exhibited little consistent reduction in variability of different characters that could be traced to the degree of inbreeding of their sire. There was a slight reduction in variability for such characters as sexual maturity, body weight, and egg weight, but no difference in the variability of winter and annual egg production. Both of the latter factors were significantly lowered by the use of inbred males.

Head type in relation to annual egg production and egg weight, L. C. CLEVENGER and G. O. HALL (*Poultry Sci., 14 (1935), No. 1, pp. 54–60, figs. 4*).—A study of 12 head measurements was made on 262 White Leghorn pullets at the [New York] Cornell Experiment Station in an effort to determine whether there was any correlation between head type, as revealed by anatomical measurements, and egg production and egg weight. It was also planned to

determine whether laying birds could be classified into different production groups by the use of head type as a composite character.

No linear correlation was found between the head measurements and production. A decided curvilinear trend was found between these factors, indicating that selection for egg production by head measurements may be made up to a certain point, beyond which there is a decrease in egg production with an increase in head size. A low but consistent negative correlation was found between major head measurements and hen load, the ratio of the total weight of eggs laid to the hen's body weight. A moderate and consistent positive linear correlation was found between head measurements and egg weight. The significant physical differences in head types were accompanied by a significant difference in egg production, indicating that it was possible and practical to classify laying hens into definite production groups by studying the head as a composite character.

Egg size in laying trials (*[Connecticut] Storrs Sta. Bul. 199 (1934), pp. 22, 23*).—The results of weighing eggs individually on breeding for increase in size are reported.

The structure of the hen's egg shell, G. F. Stewart (*Poultry Sci., 14 (1935), No. 1, pp. 24–32, figs. 12*).—In this article from the [New York] Cornell Experiment Station the author reviews the literature of experimental work on the individual parts of the eggshell.

The orientation of the embryo in the egg of the domestic fowl, M. W. Olsen and T. C. Byerly (*Poultry Sci., 14 (1935), No. 1, pp. 46–53, figs. 3*).—Eggs from White Leghorn and Rhode Island Red flocks were used in a study by the U. S. D. A. Bureau of Animal Industry to determine the causes of malposition in chick embryos at hatching time.

Of the embryos in naturally laid hens' eggs 11.8 percent were inverted on the yolks. Eggs that had their large ends caudad, whether naturally laid, manually expressed, or taken from the uteri, had a higher proportion of inverted embryos than eggs similarly obtained that had their small ends caudad. It was felt that formation of the eggs blunt end caudad was probably the chief cause of reversed orientation of the embryo.

Naturally laid, horizontally incubated eggs had 3.5 percent of their embryos rotated on their long axis so that the head turned to the left and the body on the left side at 72 hours' incubation. Incubating the eggs with large end up increased the incidence of rotation to 4.8 percent, while incubation of the small end up produced only 2 percent rotation. Data are presented to show that torsion was caused by differential growth. Reversed torsion was due to retardation of growth, and in these tests probably because of adhesion of the blastoderm to the overlying shell membrane. While rotation and the malposition head under left wing were both increased to about the same extent by incubating eggs large end up, there appeared to be no causal relation between the two.

Hatchability studies, I, II, J. J. Bronkhorst and G. O. Hall (*Poultry Sci., 14 (1935), Nos. 1, pp. 42–45; 2, pp. 112–115*).—These studies were made at the [New York] Cornell Experiment Station.

I. The physiology and chemistry of the blood of high and low hatching lines.—Blood analyses of high- and low-hatching strains of White Leghorns did not show any significant difference in the number of red cells, hemoglobin, glucose, and phosphorus of the blood of the two lines.

II. *A physical study of eggs from high and low hatching hens.*—The length of the rest period during the fall and winter was not significantly longer in the group of high-hatching hens as compared with the low-hatching hens. Neither

the refractive index of the various layers of egg white, used as an indication of percentage solids, nor the percentage of solids in the yolk bore any relationship to hatchability. The low-hatching group showed greater variability with respect to solids in yolk and white than did the high-hatching group.

On the development of the blood vessels in the head of the chick, A. F. W. Hughes (*Roy. Soc. London, Phil. Trans., Ser. B, 224 (1934), No. 510, pp. 75–129, pls. 16, figs. 2*).—In this article from the University of Cambridge, England, the author describes the development of the head vessels of the chick from the stage of 29 somites to that of hatching. The method employed in this study was that of injection of the living embryo, followed either by rendering the tissues transparent in a whole mount or by the preparation of serial sections.

Determining the sex of day old chicks, H. E. Alder (*Nebraska Sta. Circ. 51 (1935), pp. 7, figs. 8*).—The technic for determining the sex of day-old chicks is described, together with the expected economic value of segregating the sexes.

Table poultry production, A. J. Macdonald and M. R. McMurray (*Harper Adams Agr. Col. Bul. 10 (1934), pp. 26*).—The results of experiments are reported, involving a total of 5,474 chickens, on methods of brooding, rearing, feeding, and fattening table chickens. Crosses of Brown Sussex × Light Sussex, Rhode Island Red × Light Sussex, and Bresse × Light Sussex were used in this work.

There was no significant difference in the fertility and hatchability of the eggs produced by the three crosses, but the rate of growth and the quality of the carcasses of the first two crosses were superior to the last cross. There was no significant difference in the fattening results with chickens reared by the different methods. In the fattening tests there was no appreciable difference in the price obtained per pound between trough-fed birds and those that had been trough-fed and crammed. Cramming is recommended only where highly skilled labor is available.

Turkey management in Hawaii, C. M. Bice (*Hawaii Sta. Circ. 10 (1935), pp. 18, figs. 3*).—The author discusses the management of turkeys under Hawaiian conditions, including breeding, feeding, incubation, fattening for market, diseases, and production costs.

DAIRY FARMING—DAIRYING

[Dairying experiments in Connecticut] (*[Connecticut] Storrs Sta. Bul. 199 (1934), pp. 19, 20*).—Results obtained in investigations are reported on the effect of standardizing milk on cream volume, chopping hay into silos as a feed for dairy cows, and effect of corn gluten feed upon the acidity of freshly drawn milk.

Management of dairy cattle in Florida, P. T. D. Arnold, R. B. Becker, and B. McKinley (*Florida Sta. Bul. 274 (1935), pp. 52, figs. 11*).—The authors discuss the contribution of the cow to the family living, the factors determining the profitable cow, breeds of dairy and dual purpose cattle, selection and care of bulls, raising replacements, mineral supplements, factors affecting milk yield, effect of abortion disease on dairy cattle, factors affecting the butterfat content of milk, and economic phases of dairying.

The Hannah Dairy Research Institute annual report for the year ending 31st March, 1934 (Hannah Dairy Res. Inst., Ann. Rpt., *5 (1934), pp. 19, pls. 2*).—In this, the fifth annual report, a summary of the research work with dairy cattle and dairy products as conducted at the institution is given (E. S. R., 72, p. 690).

The preparation and nutritive value of A. I. V. silage for dairy cows, W. H. Peterson, G. Bohstedt, H. R. Bird, and W. M. Beeson (*Jour. Dairy Sci., 18 (1935), No. 1, pp. 63–78, figs. 2*).—Experiments at the Wisconsin Experiment Station were undertaken to investigate various phases of the A. I. V. method, particularly with reference to the preservation of protein and carotene, the presence or absence of fermentative changes, the effect upon cows of feeding silage as part of a winter ration, and the adaptability of the method to conditions of silage making in this country. Two lots of alfalfa and one of soybean silage consisting of 10, 17, and 11 tons, respectively, were prepared by this method.

The loss of nitrogen and dry matter in the drainage juice amounted to 0.9 and 1.8 percent, respectively. Based on total nitrogen, the water-soluble nitrogen in the two lots of alfalfa silage increased from 31 to 45 percent and from 15 to 40 percent, respectively, and in the soybean silage from 20 to 35 percent. The increase in amino nitrogen paralleled that of the water-soluble nitrogen, and the ammonia nitrogen also increased, but the absolute quantity was small. There was no direct loss of carotene. Bacterial counts and determinations of volatile acids and lactic acid indicated that some fermentation took place in spite of the low pH of the silage.

A double reversal feeding trial with two lots of five cows each showed no unusual changes in milk production due to feeding A. I. V. silage. Spectroscopic analyses of the butterfat during the control period showed an average carotene value of 4.2 micrograms per gram, while during the A. I. V. period this value rose to 6.8. Vitamin A analyses showed an average value of 4 micrograms per gram of butterfat during the control period and 9 during the A. I. V. period. The values for vitamin A and carotene were not as high as those found for pasture feeding. The increases in the carotene content of the blood plasma paralleled those in the butterfat. Balance studies showed an increased intake and output of carotene in the milk with the inclusion of A. I. V. silage in the ration. Blood and urine analyses indicated that the high acid intake of the cows was neutralized by means which prevented noticeable harmful effects on the animals.

Ruminant digestion without roughage, S. W. Mead and H. Goss (*Jour. Dairy Sci., 18 (1935), No. 3, pp. 163–170*).—In this study of the value of roughage in the dairy ration the California Experiment Station conducted digestion trials with heifers that had been fed for 18 mo. on a ration lacking in roughage. Similar results were conducted with heifers fed the same ration plus paper pulp. The effect of fine grinding was also investigated.

With the exception of crude fiber, the digestibility of the ration consisting of concentrates was not significantly below the calculated value for the same mixture fed with roughage. Adding paper pulp in sufficient amounts to bring the fiber content up to that of the ration of equal parts of concentrates and roughages increased the apparent digestibility of the crude fiber without significantly altering the digestibility of the other nutrients. The higher value found for the fiber in the paper pulp was due to the fact that this fiber was more highly digestible than the fiber of either roughage or concentrates. Fine grinding appeared only to lower significantly the digestibility of the crude fiber of the concentrates.

A watering device for experimental work, A. D. Pratt and H. A. Edge (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 129, 130, figs. 2*).—A simple and inexpensive watering device for measuring the water intake of experimental animals is described and illustrated in this paper from the Virginia Experiment Station.

Milk and butterfat yields of Jersey cows as affected by frequency of milking, L. Copeland (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 815–821, fig. 1*).—

An analysis of the Register of Merit records completed by registered Jersey cows showed that milking three times daily resulted in an average increase of approximately 19 percent in butterfat and 21 percent in milk yield as compared with two milkings daily. The author found that the use of a single factor for converting all records made with twice a day milking to a three milking per day basis was not satisfactory. The increase in yield due to the increased number of milkings varied greatly with the producing ability of the animal and was inversely proportional to such ability. Milking test heifers three times daily resulted in a slightly greater development than when the initial records were made on twice a day milking. Mass testing in the Herd Improvement Registry on twice a day milking was successful in differentiating between average and high-producing cows.

Nutritional anemia, calcium, phosphorus, and nitrogen balance and bone composition of rats fed raw versus pasteurized milk, H. A. Lasby and L. S. Palmer (*Jour. Dairy Sci., 18 (1935), No. 3, pp. 181–192, figs. 2*).—Experiments were conducted at the Minnesota Experiment Station to compare the severity of nutritional aaemia developed in comparative groups of rats fed either raw milk or the same milk after pasteurization.

The severity of anemia and the growth of rats was not significantly different on the two kinds of milk when pasteurization was carried out in glass in the laboratory. The iron and copper contents of the milk were not affected by the above pasteurization. When the milk is pasteurized under commercial conditions, the anemia developed may be less severe and the growth better than on raw milk due to the contact with metallic equipment in the plants.

Calcium retention was approximately the same in groups of rats fed the above milks. The phosphorus and nitrogen retentions were slightly but not significantly greater on pasteurized milk. The bones of rats fed raw milk had a higher percentage of ash than those of rats fed pasteurized milk, but the difference was probably not significant. The mean calcium and phosphorus contents of the bones of rats on raw milk were slightly but not significantly higher than those on pasteurized milk. The mean calcium and phosphorus contents of milk were the same before and after pasteurization.

The nutritional value of milks—raw vs. pasteurized and summer vs. winter, C. A. Elvehjem, E. B. Hart, H. C. Jackson, and K. G. Weckel (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 763–770, figs. 2*).—The results obtained in experiments at the Wisconsin Experiment Station by feeding mineralized raw and pasteurized milk produced during the fall, winter, and spring months are presented.

There was no difference in the growth or development of rats started in October and grown on mineralized raw and mineralized pasteurized milk over a 30-week period. The average daily gains were less during the first 6 weeks for animals started on mineralized raw milk in April than for those started in October. In April the rate of growth of rats on pasteurized milk was less than that obtained on raw milk. The daily growth rate of male rats on mineralized milk decreased from 4.2 g for October milk to 3.3 g. for December milk, and 2.5 g for February milk. The decrease for male rats on pasteurized milk was from 4 g to 2 and 1.1 g for the same periods. Female rats showed some decrease in growth rate on winter milk, bnt the decrease was not as great as that observed in males. The kind of feed ingested by the cow had a greater effect on nutritive value of milk than pasteurization. In this work pasteurization had no detrimental effect on the nntritive value of milk of high nutritive quality, but may decrease the value of milk of low nutritive quality.

The effect of homogenization on some of the physical and chemical properties of milk, G. M. Trout, C. P. Halloran, and I. Gould (*Michigan

Sta. Tech. Bul. 145 (1935), pp. 34, figs. 7).—This investigation includes tests on normal milk of average fat content homogenized raw at 90° F. and homogenized after pasteurization at 145°. Pressures of 0, 500, 1,500, and 2,500 lb. per square inch were used.

Homogenizing either the raw or pasteurized milk at 1,500 lb. pressure usually prevented the formation of a cream layer during storage. Fat clumping in homogenized milk did not occur to an extent that it exerted a major effect. The size of fat globules was more reduced at 145° than at 90° at any of the pressures used. Homogenization caused no important change in the specific gravity of milk, but the process increased the viscosity of raw milk and decreased the viscosity of pasturized milk. The surface tension of raw milk was decreased by homogenization, but that of pasteurized milk was slightly increased. Homogenization of raw whole milk always increased the titratable acidity, and it was not reduced by subsequent pasteurization. Milk pasteurized before homogenization showed no increase in acidity regardless of pressure, and the acidity of raw skim milk was not affected by homogenization. The foaming ability of raw milk was decreased and that of pasteurized milk increased by this process. The protein stability of milk toward alcohol was decreased, as was also the curd tension by homogenization.

Homogenization favored sedimentation in milk and enhanced the separation of cocoa in chocolate milk. The percentage of fat in homogenized milk as determined by the Babcock test compared favorably with that of unprocessed milk, but greater care had to be exercised in making the test on the homogenized product. Fat recovery through centrifugal separation depended upon the pressure of processing, a greater quantity being recovered by the higher pressures. Cream homogenized at 900 lb. churned more completely when ripened than when unripened. A rise of 8.1° was noted in the temperature of milk homogenized at 3,500 lb. at 145°, but this rise in temperature was lower as the pressure decreased. The rancidity that always developed in homogenized raw milk was always more rapid at the higher pressures. Pasteurization prior to or immediately following homogenization overcame this difficulty. Homogenization did not impair the flavor of milk pasteurized previous to processing, and the color of such milk was uniform throughout. When processed milk was frozen and then allowed to melt slowly, a slight cream layer was sometimes apparent. Homogenizing clarified milk following pasteurization gave a product that had none of the major defects incident to the process. The other effects of homogenization, while in some cases desirable, had no detrimental effect and were of minor importance in the production of a high quality commercial product.

A study of the relation of materials adsorbed on the fat globules to the richness of flavor of milk and certain milk products, L. M. THURSTON and J. L. BARNHART (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 131–137*).—Studies at the West Virginia Experiment Station showed that the phospholipids of milk contributed to the richness of flavor in milk products. The rich flavor of buttermilk from sweet cream was probably due to the presence of relatively high percentages of phospolipids in the buttermilk that had become disengaged from the fat globules during churning.

The relation of the fat content of milk to the passage of the milk curd from the stomach of the calf, D. L. ESPE and C. Y. CANNON (*Jour. Dairy Sci., 18 (1935), No. 3, pp. 141–147*).—In two trials at the Iowa Experiment Station calves with rumen fistulas were fed milk of varying fat contents. The milk was allowed to flow directly into the abomasum through a rubber tube to prevent dilution by saliva or fluid in the rumen. It was found that curd from milk containing up to 6 percent fat tended to leave the stomach more rapidly

than skim milk, due to the difference in texture of the curd formed. There was no evidence that milk containing this amount of fat inhibited gastric secretion or gastric motility. It appeared that fat in addition to being a valuable source of food aided digestion when incorporated in milk in limited amounts.

The action of milk fat as a foam depressant, A. Leviton and A. Leighton (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 105–112*).—In experiments by the U. S. D. A. Bureau of Dairy Industry the surface properties of milk serum prepared from skim milk by ultrafiltration were compared with the surface properties of milk serum containing 1 percent by volume of added skim milk.

Adsorption tests indicated that the action of the milk fat as a foam depressant was not due to the removal by the fat of the protein adsorbed at the air-milk interface. Surface tension and superficial viscosity measurements indicated that the action was not attended by any significant changes in the dynamic and static surface tension, or in the superficial viscosity of milk serum.

It is pointed out that the destructive action of milk fat and other lipoids on foam depends upon the ability of the substances to spread on pure water, and that theories relating to the destructive action of fat on foam that do not take into consideration the importance of spreading are subject to criticism. Procedures are described for measuring the dynamic surface tension and of an index of superficial viscosity.

A method for the determination of the relative stiffness of cream during the whipping process, W. S. Mueller (*Jour. Dairy Sci., 18 (1935), No. 3, pp. 177–180, figs. 2*).—An apparatus described in this paper consisting of a mechanical whipper and a sensitive wattmeter was used by the Massachusetts Experiment Station to obtain a continuous record of the stiffness of cream during the whipping process by recording the input of the motor in watts at intervals of 10 sec. or less. It was felt that this equipment gave very satisfactory measurements.

The distribution of phospholipoids in cream, J. L. Perlman (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 113–123, figs. 3*).—In this study it was found that the phospholipoid content of fresh cream increased uniformly with the fat content to about 55 to 58 percent milk fat, after which it diminished with further fat increases. The phospholipoid content of the fatty extract of fresh cream showed a variable decrease with the increase of fat content, indicating a variable loss of the original milk phospholipoids.

About 40 percent of the original milk phospholipoids were removed with the skim milk in producing 15 to 20 percent cream, but there was little further removal as 20 to 55 percent creams were produced. Evidence is presented that indicates a probable occurrence of a reversion of the colloidal system in fresh cream of about 55 to 58 percent fat content. There were no indications that heat alone effected the destruction of phospholipoids in milk products.

The effect of heat on milk phospholipoids, J. L. Perlman (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 125–128*).—Continuing the above experiments, no evidence was obtained to the effect that heat alone caused the destruction of lecithin and its allied phospholipoids in dairy products. It is shown that certain bacteria were capable of producing enzymes with the ability to destroy milk phospholipoids.

The iodine content of milk as affected by feeding iodized dry milk, Z. M. Hanford, G. C. Supplee, and L. T. Wilson (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 771–780, figs. 3*).—Data for this study were collected at stated intervals over a period of 3 yr. in 4 different States (E. S. R., 72, p. 523). They represent numerous iodine determinations on the composite milk from thousands of

cows, as well as many iodine determinations on composite feed samples and individual constituents of the ration.

It was found that the percentage of iodine recovered in the milk at comparable periods was practically the same, regardless of whether the iodine ingested was in such a form as that naturally occurring in ration constituents produced on the high iodine soils of South Carolina, that naturally occurring in normal ration constituents grown in other areas, or that supplied in the form of the iodized milk. The output of iodine in the milk per day did not parallel the iodine ingested, regardless of the level or form in which it was ingested. On the other hand, the iodine concentration and the total output of the milk was increased when an organic iodide supplement such as iodized dry milk was fed. It appeared that the lack of a parallel relationship between the total intake and output might be due primarily to environmental conditions prevailing during the relatively warm and cold seasons of the year, since there was a distinctly lower total output and lower percentage recovery in all areas covered during the warm months.

E[scherichia] coli in mastitis, with accompanying changes in milk composition, F. R. SMITH and J. L. HENDERSON (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 799–803*).—A Jersey cow in the herd at the California Experiment Station that had been producing 11 lb. of milk per milking dropped to 1 lb. within a 12-hr. period. This drop in production was accompanied by a loss of appetite, cessation of rumination, dull and depressed appearance, constipation, body temperature of 107° F., and a hard, hot, painful, swollen condition in the left rear quarter of the udder. A toxic strain of *E. coli* was isolated from the milk of the affected quarter. The condition described was noticeable at once by both chemical and bacteriological tests of the milk. There was evidence that even though the infection remained localized in one quarter abnormal milk was produced in all quarters. Both the chemical and microscopical tests used were satisfactory in the diagnosis of an inflammatory condition of the udder.

The use of sodium thiosulphate dilution blanks in determining the germicidal efficiency of chlorine sterilizers, C. C. PROUTY and R. T. OLSON (*Jour. Dairy Sci., 18 (1935), No. 3, pp. 171–175*).—This investigation at the Washington Experiment Station was undertaken to determine to what extent the presence of sodium thiosulfate in the dilution blank was of value in preventing the bacteriostatic action of chlorine as shown by the subsequent colony counts. Simultaneous platings of inoculated chlorine solutions immediately after inoculating and after 2.5, 5, 7.5, 10, and 15 min., using ordinary dilution blanks and blanks containing sodium thiosulfate, were made and compared.

An increased colony count resulted in most cases when sodium thiosulfate dilution blanks were used. Colony development after brief periods of exposure of the organisms to the action of chlorine showed in most cases an increased count when the sodium thiosulfate dilution blanks were used, but after 10 or more minutes' exposure the presence of sodium thiosulfate had little or no subsequent effect. The results showed that plate counts, using ordinary dilution blanks, may be misleading in determining the germicidal efficiency of chlorine sterilizers. A comparison of the effect of dilution on the bacteriostatic effect of residual chlorine showed that in no instance were more colonies found to develop on plates of the higher dilution than on plates of lower dilution.

Dairy products, A. PITCAIRN (*Cyprus Agr. Jour., 29 (1934), No. 4, pp. 103, 104*).—The processes followed in the manufacture of Hallumi, Kefalotiri, Kaskavalli, Paphos, and Anari cheeses, and the milk products yiagourt and mahallebi are described in this article.

The use of citric acid and sodium citrate in buttermaking, H. L. TEMPLETON and H. H. SOMMER (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 97–104*).—Continuing the previous studies (E. S. R., 61, p. 564), it was found that the addition of citric acid or sodium citrate to either cream or the starter or both tended to produce a butter of more desirable flavor and aroma than untreated butter made from the same cream. The results also confirmed previous findings on the effect of high acidity in some samples of butter scored, while in other cases there was little difference in the score of fresh butter and the score after storage. In many samples the score after 6 weeks' storage was higher than the score of the same butter when fresh. The use of citric acid tended to lower fat losses in the buttermilk, and the flavor and aroma of buttermilk from treated cream compared favorably with the starters. The addition of citric acid or its equivalent in sodium citrate in amounts not to exceed 0.2 percent of the weight of the cream was sufficient to increase the score of the butter. Adding these improvers to the starter only was noticeable in the score of the butter.

The Vogt method of manufacturing flake buttermilk, E. S. GUTHRIE (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 139, 140*).—In this paper from the [New York] Cornell Experiment Station the author describes the details of manufacture of the Vogt process of making flake buttermilk. The advantages of this method are discussed.

A study of some factors influencing the Hill curd test, W. J. CAULFIELD and W. H. RIDDELL (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 791–798*).—At the Kansas Experiment Station an investigation was planned to determine the influence of certain modifications in technic on the results of the Hill test.

With a relatively large number of determinations on the same sample of milk, results indicated that the difference between skilled operators was small. The temperature at which the test was run was one of the most important factors influencing the results. Variation in the time interval between the addition of the coagulant and cutting of the curd had a significant influence on results, especially with milk of medium curd tension. Reducing the amount of pepsin, pepsin-calcium chloride solution, or calcium chloride solution below that specified in the Hill curd test gave higher results, while increasing the amount of these coagulants gave lower values. Adding the milk to the coagulant was an accurate method of mixing the two and was more rapid and easier to perform than the present recommended procedure. It was found that all conditions of the test should be carefully controlled in order to make the results accurate.

The mechanical control of the fat content of Swiss cheese, W. V. PRICE and G. C. NORTH (*Jour. Dairy Sci., 18 (1935), No. 3, pp. 149–161, figs. 5*).—During the peak of cheese production in 1933 the Wisconsin Experiment Station made a study at 20 factories to determine under factory conditions the relation of the mechanical control of the fat content of the cheese to the composition and commercial quality of the finished product.

It was found that the mechanical control of the fat content depended upon accurate standardization. The simultaneous clarification and separation of milk, excessive losses of fat in whey, and milk with abnormally low fat content made standardization difficult. Removing on the average more than approximately 10 percent of the total fat from the lots of milk observed or the establishing of casein-to-fat ratios greater than approximately 0.81 tended to produce cheese of less than the legal fat content. Because unusual biological conditions in the milk or special methods of curd-making may cause variations in the composition of cheese, it was deemed essential that the milk, whey, and cheese from every kettle be analyzed.

Color development in lactose solutions during heating with special reference to the color of evaporated milk, B. H. Webb (*Jour. Dairy Sci., 18 (1935), No. 2, pp. 81–96, figs. 4*).—A series of experiments was carried out by the U. S. D. A. Bureau of Dairy Industry on lactose solutions held during heat treatment at known pH values by means of suitable buffers.

Reproducible color standards for measuring color of lactose solutions in which heat had produced varying shades of brown are described and defined in numerical terms according to the Munsell system of color measurement. The presence of the phosphate radical in such solutions during heating caused a specific darkening. Color development in these solutions was increased during heating with increasing concentrations of hydroxyl ions, lactose, amino acids, ammonium salts, phosphate, and oxygen. The presence of copper and iron catalyzed the color reaction, while tin retarded it. Very small quantities of formaldehyde increased color, while larger amounts restricted the development. Sodium bisulfate prevented the appearance of color. The color developed when amino acids or proteins were present during heating was probably due to the formation of a complex material formed from the lactose and an amino group and to a polymerization of the sugar to lactocaramel. Either reaction may occur at the pH found in milk.

While an effective means of preventing color development in lactose solution during heating that would be suitable for use in improving the color that appears in evaporated milk during sterilization was not found, the results obtained show that the objectionable darkening of evaporated milk that occurs during storage may be materially lessened by shortening the storage period or lowering the storage temperature.

Controlling physical properties of high solids mixes, M. J. Mack (*Jour. Dairy Sci., 17 (1934), No. 12, pp. 781–789, figs. 3*).—Studies were undertaken at the Massachusetts Experiment Station in an attempt to overcome some of the problems involved in the manufacture of ice cream having a relatively high total solids content.

When made under the usual processing conditions high solids ice cream mixes were excessively viscous, and a crumbly product possessing an undesirable melting appearance resulted. Using butter, frozen cream, or plastic cream to replace part or all of the sweet cream markedly increased these defects. Using a homogenizer with three successive stages eliminated these conditions. Pressures of 2,000, 500, and 150 lb. are suggested as the maximum pressures for the respective stages when homogenizing an 18 percent butterfat mix. With a 20 percent mix, pressures of 1,500, 500, and 150 lb. are suggested as maximum pressures.

A crumbly body may be prevented in high butterfat ice creams by increasing the sugar content to 16 to 17 percent. When cane sugar alone produces an excessively sweet taste, the substitution of 3 to 4 percent of corn sugar is recommended. This increase in sugar content improved the melting appearance and reduced the melting resistance of high fat ice creams. Three-stage homogenization eliminated the excessively high viscosity that occurred in chocolate ice cream mixes of high solids content.

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[Work in animal pathology by the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 199 (1934), pp. 9–19*).—The work of the year referred to (E. S. R., 71, p. 96) includes infectious abortion; the microbic dissociation of the *Brucella abortus-melitensis* group; comparison of diagnostic methods for mastitis, charac-

teristics of streptococci of bovine origin, development of a system of control through segregation of infected animals, and determination of the value and limitation of bacterins in the control of mastitis; studies on infectious tracheitis and allied respiratory diseases of poultry; studies on coccidiosis; paralysis in lambs of nutritional origin; treatment of necrobacillosis of the male reproductive organs in sheep; and a survey of animal diseases occurring in the State, based on laboratory diagnosis.

[Work with diseases of livestock in Kenya] (*Kenya Dept. Agr. Ann. Rpt., 1933, pp. 231–381*).—A report of the deputy director and chief veterinary officer, H. H. Brassey-Edwards (pp. 231–347), includes information on the occurrence of and control work with infectious diseases of livestock and some research work at the laboratory at Kabete. The work of the chief veterinary research officer, R. J. Daubney (pp. 348–381), includes the results of work with rinderpest, Nairobi sheep disease, bluetongue virus in cattle, horse sickness, snotsiekte, rabies, contagious bovine pleuropneumonia, Bang's disease, hemorrhagic septicemia, paratyphoid infection in calves, anthrax, black quarter, East Coast fever, trypanosomiasis, fowl typhoid, pullorum disease, etc.

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 13 (1934), No. 3, pp. 163–257, pls. 5, figs. 3*).—The contributions presented (E. S. R., 72, p. 249) include the following: Studies on Hemorrhagic Septicemia Organisms—Report VI, On the Relation between Four Types of Hemorrhagic Septicemia Organisms Classified by Me and the Diseases of Various Animals Caused by Them, by Y. Ochi (pp. 163–180, Eng. abs. pp. 178–180) (E. S. R., 71, p. 97); Serological Studies on Hemorrhagic Septicemia Organisms, Especially on Their Complement Fixation Reaction, by K. Zaizen (pp. 181–191, Eng. abs. p. 191); On Types of *Bac[terium] suipestifer* Isolated from Swine in Manchukuo, by S. Watanabe (pp. 192–206, Eng. abs. pp. 205, 206); The Influence of S-Compounds on the Growth of *Bacterium pullorum*, by S. Ito (pp. 207–212, Eng. abs. p. 212); On the Bionomics of the Warble Fly [Common Cattle Grub and *Hypoderma ovis*] Observed in the Vicinity of Ohri, Inner Mongolia, by S. Ono and T. Yamasaki (pp. 213–223, Eng. abs. pp. 222, 223); Swine Paratyphus, by S. Nohmi and Y. Terakado (pp. 224–236, Eng. abs. pp. 230–234); Studies on the Reproduction in the Mare—III, The Oestrous Duration and Oestrous Cycle, by S. Sato and S. Hoshi (pp. 237–252, Japan. abs. pp. 250–252) (E. S. R., 71, p. 97); and A Case of *Isospora* Infection in A Hawk [*Accipiter gentilis schevedowi* Menzb.] [trans. title], by K. Miyamoto (pp. 253–257, Japan. abs. pp. 256, 257).

Host-parasite relations between domestic animals and their protozoan parasites, W. J. Lentz (*Penn. Univ., Vet. Ext. Quart. No. 58 (1935), pp. 23, figs. 22*).—This discussion is presented with a list of 29 references to the literature.

Parasites carried by wild animals of importance to man and domestic animals, T. W. M. Cameron (*Internatl. Assoc. Game, Fish, and Conserv. Commrs. Conv., Montreal, Proc., 28 (1934), pp. 79–83*).—A brief summary of information.

An attempt to ascertain the behavior of Anaplasma marginale in ticks transmitting anaplasmosis, E. V. Cowdry and C. W. Rees (*Amer. Jour. Hyg., 21 (1935), No. 1, pp. 94–100*).—In the experimental work here reported, presented with a list of 21 references to the literature, no traces of a microscopically demonstrable organism were found in ticks transmitting anaplasmosis not present in controls.

The pathogenicity of Bacillus gigas Zeissler and Rassfeld 1929 [trans. title], F. C. Kraneveld (*Nederland. Indische Bl. Diergeneesk., 45 (1933), No. 5,*

pp. 440–494, pls. 2, figs. 6; Ger., Eng. abs., pp. 489–494).—The author has found *B. gigas* to be pathogenic for the horse, cattle, water buffalo, sheep, goat, hog, dog, cat, guinea pig, rabbit, white laboratory rat, common Java rat (*Rattus rattus diardi* Jent.), white mouse, fowl, and European and Java pigeon. The most typical lesions produced are as follows: "Strong edema of the subcutis and of the intra- and inter-muscular fibrous tissue on the injection spot; severe inflammation of the muscular tissue with eventually necrosis and exceptionally slight gasification; in the abdominal cavity and in the pericardium a large quantity of a mostly clear transudate, which in the same way as the edematical fluid of the subcutis coagulates very soon when exposed to the air; [and] hyperemia of the mucosa of the stomach, especially the fundus, and of the gut, especially the small intestine."

Field studies of the anthelmintic action of ortho-heptylphenol and 6-hexyl-meta-cresol against Ascaris lumbricoides, Necator americanus, and Trichuris trichiura, P. D. Lamson, D. M. Molloy, and H. W. Brown (*Amer. Jour. Hyg., 21 (1935), No. 1, pp. 188–199*).—In the work reported, "orthoheptylphenol and 6-hexyl-meta-cresol, substances which are the lowest members of their respective series of orthoalkylphenols and 6-alkyl-meta-cresols which cause no whitening of the oral mucous membranes, have each been tested for their anthelmintic properties in approximately 100 cases harboring *Ascaris*, *Necator*, and *Trichuris*. Orthoheptylphenol reduced the egg count in ascariasis approximately 35 percent, in uncinariasis 60 percent, and in trichuriasis 40 percent in doses as great as 4 cc. 6-hexyl-meta-cresol reduced the egg count in ascariasis approximately 55 percent, in uncinariasis 70 percent, and in trichuriasis 30 percent in doses as great as 4 cc. In the 220 cases treated, no pathological signs or symptoms were noticed, no complaints were made by the patients, and all went about their daily work without interruption."

A comparative investigation of the value of the blackleg virus and formolized vaccine [trans. title], L. de Blieck and J. Jansen (*Tijdschr. Diergeneesk., 62 (1935), No. 3, pp. 117–127; Ger., Eng., Fr. abs., p. 127*).—It was found that vaccine made by adding 0.2 percent of formol to cultures of *Bacillus chauvei* cannot be used, as it may set up post-vaccination blackleg. A culture vaccine of *B. chauvei*, prepared by the addition of from 0.5 to 1 percent of formol, is a harmless vaccine, always conferring a solid immunity. It is concluded that a formol vaccine of *B. chauvei* will prove to be the best vaccine against blackleg.

A note on the susceptibility of ferrets to the virus of the common cold, W. C. Noble, Jr., and D. H. Brainard (*Jour. Bact., 29 (1935), No. 4, pp. 407–409, figs. 2*).—It was found possible "to produce symptoms of a mild respiratory disease in 4 of 12 ferrets by inoculation with filtered bacteria-free nasal washings from human cold cases, and apparently to transmit this condition from a ferret to a human being. The one attempt to transmit it serially from ferret to ferret was unsuccessful. The evidence presented is based on a small number of animals, but would seem to indicate that ferrets are susceptible to the virus of the common cold."

The cultivation of the virus of foot-and-mouth disease in vitro [trans. title], H. S. Frenkel and G. M. van Waveren (*Tijdschr. Diergeneesk., 62 (1935), No. 5, pp. 233–243, fig. 1; Ger., Eng., Fr. abs., pp. 241–243*).—A brief review of the literature on the cultivation of the foot-and-mouth diease virus is followed by a description of the method by which the authors cultivated it.

The treatment of septicaemia in rabbits with lymph-gland fixation abscesses, A. C. Alport (*Brit. Jour. Expt. Path., 15 (1934), No. 3, pp. 175–179*).—In the author's studies fixation abscesses, obtained by the subcutaneous injec-

tion of desiccated lymph gland, were used for the treatment of septicemia in rabbits in order to cause a leucocytosis and increase the bactericidal power of the blood. Nine normal rabbits were used. Four controls, which received intravenous injections of virulent streptococci only, all died. The other five, which received similar doses of streptococci intravenously and were also given subcutaneous injections of lymph gland, all recovered.

Artificial immunization of rats against Trichinella spiralis, O. R. McCoy (*Amer. Jour. Hyg., 21 (1935), No. 1, pp. 200–213*).—In the experimental work reported, "the majority of rats given six intraperitoneal injections at 5-day intervals of living trichina larvae, heat-killed larvae, or dried and powdered larvae developed some degree of immunity against a subsequent light infection with *T. spiralis*. The degree of immunity in the individual animals varied from none to practically complete. The injection of living larvae was usually more effective in establishing immunity than the injection of either heat-killed larvae or dried and powdered larvae. Artificially immunized rats showed little or no resistance to the initial development of adult worms in the intestine, but the worms were lost more rapidly than in control animals."

Some factors predisposing to infection by Vibrion septique from the alimentary tract: An experimental study, G. R. Borthwick (*Brit. Jour. Expt. Path., 15 (1934), No. 3, pp. 153–160*).—In the studies reported H-ion concentrations within the range pH 5 to pH 6 were found most favorable for the maintenance of activity of *V. septique* toxin. "Narcotine has a depressant influence on the movements of the gastrointestinal system of guinea pigs. Exposure of the guinea pig to a low temperature (0°–5° C.) produces no alteration in the movements of the alimentary canal. The H-ion concentration of the gastric contents is of little importance in determining the production of a *V. septique* infection from the alimentary canal. Animals in which alimentary activity has been reduced by the drug narcotine frequently show evidence of infection by *V. septique* after intragastric administration of culture. Exposure of guinea pigs to a low temperature, before administration of culture, predisposes to infection by *V. septique*. Culture at approximately 0°, introduced into the stomach of normal animals, does not readily cause infection. The general character of the changes found in the internal organs on post-mortem examination indicates the presence of a toxemic condition in animals infected by *V. septique*. Intragastric administration of toxin alone to guinea pigs, whether normal, with the gastric contents adjusted to pH 5 or pH 7.6, or treated with narcotine, does not produce intoxication. The toxin is apparently not absorbed from the lumen of the stomach."

Experiments with the "O" antigen of Clostridium oedematis maligni (Vibrion septique), D. W. Henderson (*Brit. Jour. Expt. Path., 15 (1934), No. 3, pp. 166–175*).—The author's studies have shown that an active antibacterial immunity can be established against *C. edematis maligni* infection by the use of pure O antigen. "The immunity developed is type-specific. A common 'O' antigen, however, is shared by strains in varying degree and is effective in producing minimal degrees of cross-protection. Reaction to infection in immunized animals is generally associated with a severe local perforating gangrene. The O antigen functioning in agglutination and complement fixation is directly responsible for the production of the protecting immune body. A classification of *C. edematis maligni* strains is suggested. The basis of primary differentiation should be the O antigen relationship, and the H antigen content should form the basis of a secondary grouping."

A note on the non-poisonous properties of Osage oranges (Maclura pomifera), H. W. Johnson, R. Graham, and J. P. Torrey (*Jour. Amer. Vet.*

Med. Assoc.; 86 (1935), No. 5, pp. 667, 668).—It was found that the expressed juice of Osage oranges, administered to a horse and a cow by mouth in 1-l doses, induced no clinical symptoms of poisoning. The nonsterile, filtered juice injected subcutaneously into guinea pigs, rabbits, and pigeons failed to produce toxic symptoms. The feeding of Osage oranges disguised in mash to chickens failed to induce symptoms.

Poisoning due to thallium sulphate, E. P. JORDAN (*Jour. Amer. Med. Assoc., 104 (1935), No. 15, pp. 1319–1321*).—This is a case report of poisoning in a man 38 yr. of age caused by chemically pure thallium sulfate accidentally picked up by a sandwich placed on a table on which experiments with this substance had been performed.

An investigation of the causal agent of bovine pleuropneumonia, F. F. TANG, H. WEI, D. L. MCWHIRTER, and J. EDGAR (*Jour. Path. and Bact., 40 (1935), No. 2, pp. 391–406, pls. 4*).—In the course of work at Shanghai, China, "the isolation of the virus of pleuropneumonia was effected by the ordinary bacteriological methods of plating, dilution, and filtration, the last being the most serviceable. The virus could be cultivated aerobically or anaerobically in solid, semisolid, and fluid media. Bennett's broth was used as a basic medium in this investigation."

The use of gelatin in rapid-test preparations of *Bact. abortus* antigen: Variations in the effect of gelatin, in Bact. abortus antigen preparations, on the agglutination titers of bovine serums, C. R. DONHAM and C. P. FITCH (*Jour. Infect. Diseases, 56 (1935), No. 2, pp. 203–209*).—It was found that when used in rapid test antigen preparations gelatin increases the sensitivity for some but not all serums. "There are an important number of bovine serums whose titers are not increased when gelatin is incorporated in the antigen preparation. To this extent (the unequal effect of gelatin in the antigen preparation), the practice of adding gelatin to rapid test *B. abortus* antigen preparations is unsatisfactory. Variations in the effect of gelatin in the antigen preparation on the serological behavior of 'nonspecific' agglutinating substances in serums are similar, if not identical, to those observed in 'specific' agglutinins. This is evidence to support the common assumption that the behavior of nonspecific and specific agglutinating substances are dependent on similar, if not identical, agglutinating forces. The phenomenon of hysteresis does not measurably affect the sensitivity of rapid test antigen preparations containing small amounts of gelatin. This is probably due to the relatively minute amounts of gelatin employed in such test fluid."

Some observations on the isolation of Brucella organisms from raw milk, M. M. BARRATT (*Jour. Compar. Path. and Ther., 48 (1935), No. 1, pp. 43–50*).—Of 157 milk samples, the majority of which were ordinary milk, examined at the Lister Institute, London, for *B. abortus* by guinea pig inoculation, 34 were found to be infected. "An additional infected sample was found among 16 animals that died prematurely. *B. abortus* was not isolated from the 5 pasteurized samples examined. The only sample of certified milk examined contained *B. abortus*. In more than half the samples cultures were made from the local glands as well as from the spleen. In 6 of 29 animals in this group from which positive cultures were obtained the organism was found in the glands but not in the spleen. The sera of 42 guinea pigs were examined for agglutinins and close agreement found with the cultural results. The only discrepancy was in favor of the cultural examination, but other series of animals somewhat similarly examined have shown that the reverse may occur. Nine of the 36 strains of *Brucella* isolated did not require CO_2 for primary culture or early subculture. The choice of procedure in such examinations and the significance of the non-CO_2 sensitive strains is discussed."

The intradermal test in undulant fever: Reactions in healthy and infected individuals, G. O. FAVORITE and C. F. CULP (*Jour. Lab. and Clin. Med., 20 (1935), No. 5, pp. 522–526*).—The authors have found that the use of a bacterial suspension of killed *Brucella abortus* gives a specific intradermal reaction in undulant fever which is easily distinguished from a nonspecific response. The bacterial suspension may be adjusted by dilution and attenuation to the desired reaction, as determined by preliminary tests on normal human individuals.

The growth of Mycobacterium paratuberculosis in tissue cultures, C. B. LINE (*Michigan Sta. Tech. Bul. 142 (1935), pp. 30, figs. 20*).—A brief introduction is followed by a review of the literature and descriptions of the technic, living cultures, and fixed cultures of *M. paratuberculosis*, the causative organism of paratuberculosis, commonly known as "Johne's disease." When inoculated into cultures in vitro of guinea pig spleen, it survived and apparently grew both intracellularly and extracellularly. "Evidence is presented which indicates that the polymorphonuclear leucocyte is capable of phagocytosing and digesting the organism intracellularly, and that ferments liberated by the disintegrating polymorphonuclear leucocytes apparently lyze nearby Johne's bacilli. A diffusible substance, strongly chemotaxic for and toxic to polymorphonuclear leucocytes, was liberated by the Johne's bacillus. Macrophages and giant cells engulfed the organisms wherever they encountered them, but apparently had little power of lyzing the engulfed rods. On the contrary, the Johne's bacilli seemed to find the cytoplasm of such cells a favorable medium of growth. In the cultures herein described giant cell formation took place by cell fusion and, in some few instances, apparently by nuclear division. Such cell fusion took place with greater frequency in liquid medium."

Paratuberculosis of cattle (Johne's disease), R. GRAHAM, F. THORP, JR., and J. P. TORREY (*Illinois Sta. Circ. 434 (1935), pp. 12, figs. 5*).—A practical summary of information on this disease of cattle.

A possible case of congenital Johne's disease, G. W. DUNKIN (*Jour. Compar. Path. and Ther., 48 (1935), No. 1, pp. 36–40, figs. 3*).—A case report.

The oxytocic property of the blood and its relation to milk fever in cows, G. H. BELL and S. MORRIS (*Brit. Jour. Expt. Path., 15 (1934), No. 3, pp. 143–147, figs. 2*).—In this contribution, six cases of milk fever in cows are reported in which the oxytocic content of the blood was found to average 3 oxytocic units per liter. Six controls showed no measurable oxytocic content. The biochemical findings in milk fever are compared with those occurring after injection of pituitrin. These suggest that milk fever may be due to excessive or continued secretion of pituitary hormone after parturition. An unsuccessful attempt to confirm this experimentally is described.

Significance of streptococci, and a high leukocyte count, H-ion concentration, and chlorine content in cow's milk, L. A. KLEIN and R. LEARMONTH (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5, pp. 600–619*).—The authors' studies, presented with a list of 19 references to the literature, are summarized as follows:

"Streptococci similar to the mastitis type were present in the udders of a number of cows for a considerable period without the development of clinical mastitis. The leucocyte count was a million or over, the pH above 6.8, or the chlorine content 0.14 or over, and mastitis streptococci were present, in the milk of cows which did not develop clinical mastitis. These changes frequently did not occur in the milk when streptococci were present, and yet did occur when streptococci were not present. The leucocyte count, pH, and chlorine content of the milk of cows with normal udders free of streptococci more often

exceeded the limits stated above in the early and late stages of lactation than in the intermediate stages. The same changes were observed more often in the milk of cows with noninfected normal udders which were in the later periods of lactation, from the fourth or fifth on (older cows), than in the earlier periods (younger cows).

"These observations raise the question as to whether the examination of milk for streptococci, and to determine the leucocyte count, pH, or chlorine content, should be depended upon as the sole means of deciding if a cow is suitable to produce market milk, although such examinations, in connection with other methods may be helpful in diagnosis and may also be of assistance in controlling the spread of streptococcic infection, thus preventing the development of clinical mastitis. From our study it would appear that the period of lactation and the stage of lactation should be considered in interpreting the results of the laboratory tests of milk.

"Limited areas of induration were found in udder quarters which were not infected with streptococci, as well as in those which were infected with these organisms, but much less frequently in the former than in the latter. Small flakes were observed infrequently in the first streams of milk from noninfected as well as infected quarters, but they appeared in the milk of more of the infected quarters than the noninfected."

The isolation of the organism of avian tuberculosis from cattle, W. H. Feldman and C. F. Schlotthauer (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5, pp. 635–643*).—Working with a herd of dairy cattle that had been tuberculin tested annually for a period of 11 yr. and in which there was cohabitation with tuberculous chickens, the authors attempted by culture methods and the inoculation of laboratory animals to isolate the tubercle bacillus from 11 head that had reacted to the test. In no instance was the bovine type of the organism obtained, although 4 strains of the avian type were isolated from 3 of the animals, it having been secured from a tuberculoid lesion in the subcutis and from a mesenteric lymph node of 1 animal, from a mesenteric lymph node only of the second animal, and from an abscess in the subcutaneous tissue of the third cow.

It is pointed out that these findings confirm those of other workers as regards the occurrence of the avian type in cattle, and provide additional evidence that this type of tubercle bacillus may not infrequently sensitize cattle to both mammalian and avian tuberculins.

The occurrence of the northern cattle grub in Finland and the economic losses caused by it [trans. title], R. Stenius (*Skand. Vet. Tidskr., 25 (1935), No. 3, pp. 133–146, fig. 1; Eng. abs., pp. 145, 146*).—Information received from tanneries in Finland has led the author to estimate that an average of 28 percent of all the hides was damaged by the northern cattle grub.

Tick-borne diseases of cattle in Ceylon, M. Crawford (*Trop. Agr. [Ceylon], 84 (1935), No. 3, pp. 124–130*).—The blood parasites *Piroplasma bigeminum, Anaplasma marginale,* and *Theileria mutans* occur commonly and are transmitted by ticks in most parts of Ceylon.

Chronic toxicosis in dairy cows due to the ingestion of fluorine, P. H. Phillips, E. B. Hart, and G. Bohstedt (*Wisconsin Sta. Res. Bul. 123 (1934), pp. 30, figs. 6*).—A report is made of the results of feeding experiments commenced in 1928 and continued with a view to determining the chronic toxicity, tolerance, and physiological effects of the ingestion of small quantities of fluorine over a long period of time.

It is pointed out that crude rock phosphate contains approximately 3.5 to 4 percent of fluorine, while superphosphate may still contain from 1.5 to 2

percent, and that in the United States some 90,000 tons of fluorine are added to the top soil annually through the use of superphosphate fertilizers. It was found that "fluorine intakes of 1 to 2 mg per kilogram of body weight do not materially retard growth. Should the intake level exceed 3 mg per kilogram of body weight throughout the growing period growth is retarded. Thus the limit of fluorine intake compatible with growth in dairy cattle is approximately 2 to 3 mg. Likewise intakes of fluorine exceeding 3 mg per kilogram of body weight during lactation resulted in extreme loss of weight and reduced milk production. Hence the critical margin of fluorine tolerance in dairy cows appears to be 2 to 3 mg per kilogram of body weight. Feed consumption is markedly restricted when the fluorine intake exceeds the margin of tolerance and inanition resulting in marked cachexia prevails.

"Fluorine in the ration of dairy cows does not cause a functional failure of the reproductive processes, but it does delay estrum following parturition and lowers the birth weight of new-born calves. The nutritional state of the animals suffering from chronic fluorosis is thought to be responsible for these results.

"Fluorine cachexia in dairy cattle caused by including 1.25 and 2.50 percent of raw rock phosphate in the grain mixture reduces the milk production 20 to 25 and 40 to 50 percent, respectively. The factor which is responsible for the deleterious effects of raw rock phosphate is its fluorine component.

"No appreciable change in the nutritional qualities of the milk from fluorine cows could be detected by chemical or biological means. It appears that the fluorine content of milk is difficult to influence by ordinary nutritional practice.

"The pathology of fluorosis in dairy cattle is distinctive. It is marked by a disturbed osseous metabolism which results in great thickening and exostosis of the long bones and mandibles. The ribs are likewise flattened and enlarged. Microscopically various forms of degeneration, including hyaline, hydropic, parenchymatous, and fatty degeneration, were observed. These studies supported by oxygen uptake studies on certain tissues suggest that fluorine toxicosis produces its systemic reaction through an interference with cellular respiration, and that the primary point of attack is the enzymatic systems of the body.

"The teeth of cattle are affected in chronic fluorosis, which results in excessive abrasion of the second and third molars as well as the premolars. Hypoplasia was apparent in the enamel. A definite crystalline structure was obtained for both enamel and dentine and in all cases resembled normal teeth in this respect. The ingestion of fluorine results in a marked storage of fluorine in the inactive tissues such as the skeleton and teeth. More active organs such as the liver are very low in their fluorine content.

"A well-balanced ration containing ample energy, protein, calcium, and phosphorus through the use of selected feeds does not require calcium and phosphorus supplements where the annual milk production is 10,000 lb. and the animals are kept under ordinary farm practice. Raw rock phosphate is highly unsatisfactory as a mineral supplement because of the harmful effects due to its fluorine content. Raw rock phosphate produced typical fluorine toxicosis at the lowest level (0.625 percent of the grain mixture) fed in this experiment. At this level of rock phosphate in the ration the symptoms of fluorosis appeared considerably later than at the higher levels.

"In general these studies show in no uncertain terms that very small amounts of fluorine are exceedingly toxic to the animal organism when fed over long periods of time, and that the use of materials containing appreciable quantities of fluorine cannot be used without disastrous results. A tolerance limit which

is safe for cattle has not been determined, and lies well below levels used in this experiment."

Treatments for cyanide poisoning of sheep and cattle, H. BUNYEA (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5. pp. 656–661*).—This is a summary of work with treatments for cyanide poisoning of sheep and cattle, of which earlier accounts by the author and his associates have been noted (E. S. R., 67, p. 165; 73, p. 242).

The influence of grazing on the natural immunity reactions and intradermal toxin tests in sheep, E. J. M. ANDERSON, A. H. H. FRASER, and T. J. MACKIE (*Jour. Compar. Path. and Ther., 48 (1935), No. 1, pp. 51–57, figs. 3*).—In studies at the University of Edinburgh, "the natural hemolytic activity of sheep serum toward rabbit erythrocytes was found to be higher in grazing animals than in comparable sheep on an artificial ration. A similar difference was noted in the natural bactericidal reaction toward a strain of *B[acillus] coli*. No such difference was apparent in the complementary power of the serum or in the β-lysine (tested with *Streptococcus haemolyticus*) or agglutination reaction with *B[rucella] abortus*. A group of sheep fed on fresh green food in indoor pens did not show the same increase in the two reactions mentioned above as did the grazing group. The proportion of sheep showing a negative reaction to a given dose of the toxin of the lamb dysentery bacillus (*B[acillus] welchii* type B) was greater in the grazing group than in those fed on green food and on the artificial ration."

"Swelled head" or "big head" in rams due to localised infection by Clostridium oedematiens: Serous, non-gaseous, malignant oedema of the head of rams, L. B. BULL (*Jour. Compar. Path. and Ther., 48 (1935), No. 1, pp. 21–35*).—This is a report of work conducted by the author in South Australia.

Involution of the uterine mucosa in the ewe, A. W. UREN (*Michigan Sta. Tech. Bul. 144 (1935), pp. 64, figs. 43*).—Work is reported in which the "involutionary changes in the mucosa of the uteri of 18 ewes have been traced from a few hours after parturition to 30 days post partum. Involution of the uterine glands is found to be a relatively rapid process in comparison with that in other parts of the mucosa. This appears to result from vacuolar degeneration and exfoliation of the epithelium. The first involutionary change seen in the cotyledon is a zone of hyaline degeneration involving the base of the crypts. There rapidly follows a zone of necrosis, beginning at the apexes of the crypts and progressing toward their bases. In the seventh day post partum uterus all the cells of the crypts are necrotic. As the puerperium advances, the necrotic crypt mass is eliminated as a result of liquefaction and exfoliation. Following elimination of the crypt mass, the epithelium of the glandular mucosa proliferates and spreads over the placental matrix cells. The process was not complete in the twenty-sixth day post partum uterus but was complete in the thirtieth day post partum uterus."

Hemorrhagic icterus of sheep [trans. title], J. CUILLÉ and P. CHELLE (*Rev. Vét. [Toulouse], 87 (1935), Jan., pp. 5–13, pl. 1*).—Further work in which inoculation failed has led the authors (E. S. R., 72, p. 257) to doubt that *Anaplasma ovis*, found present in small numbers, is the cause of hemorrhagic icterus of sheep in France.

Hemorrhagic icterus and anaplasmosis [trans. title], H. CARRÉ (*Rec. Méd. Vét., 111 (1935), No. 2, pp. 71–83, figs. 2*).—The author has failed to infect normal sheep through injection of blood from animals suffering with hemorrhagic icterus, and has been unable to detect any pathogenic agent either through direct examination of the blood or by inoculation.

Non-caseous lymphadenitis in imported lamb or mutton, D. M. STONE and A. G. MORISON (*Med. Officer, 53 (1935), No. 12, pp. 115, 116, pl. 1*).—The authors

report upon cases of noncaseous lymphadenitis of sheep, an affection which it is thought may hitherto have been mistaken for caseous lymphadenitis. "The condition appears to be a precise entity, capable of recognition both by the naked eye and microscopically. The histological and bacteriological findings suggest that it is the result of a generalized irritation, possibly streptococcal in nature."

A species of Demodex found in sheep in Britain, A. BROWNLEE (*Jour. Compar. Path. and Ther., 48 (1935), No. 1, pp. 68–73, fig. 1*).—An undetermined species of *Demodex* is said to be a fairly common parasite of sheep in Great Britain, being found most frequently in the sebaceous glands of the skin in the region of the vulva and the prepuce. There are indications that it is more common in debilitated and emaciated sheep than in sheep in good physical condition. The species appears to be benign and of no pathogenic significance.

Copper sulphate as an anthelmintic for gastro-intestinal parasites of sheep, J. H. RIETZ (*West Virginia Sta. Bul. 264 (1935), pp. 20*).—Experiments conducted with two flocks of sheep are reported, the details being given in 19 tables.

It was found that the withholding of all food for a period of 24 hr. before treatment increased the efficiency of the anthelmintic in the sheep used in these trials, apparently by influencing the passage of the drench solution to the abomasum. A 1.5 percent solution of copper sulfate was the most effective anthelmintic used against stomach worms, and was effective in removing tapeworms from the intestines when regularly and systematically administered. Regular and systematic treatment at intervals of 21 days reduced the intestinal nematode infestation. No ill effect was noted from a 1.5 percent solution of copper sulfate as used in these trials. "Feeding of good food in proper quantities is an essential factor in the successful use of anthelmintics (copper sulfate) in the elimination of gatro-intestinal parasites from sheep."

Stiff-lamb investigations.—Preliminary report, A. M. LEE and L. H. SCRIVNER (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5, pp. 644–655, figs. 5*).—Contributing from the Wyoming Experiment Station, the authors report upon a study made of the history, symptoms, gross and microscopic lesions, and bacteriological findings of a condition in Wyoming referred to by sheepmen as "stiff lambs."

The gross lesions encountered were somewhat variable and consisted of arthritis, white skeletal muscle lesions, grayish white areas, and streaks in the heart and in the kidneys. "Microscopical examination of the white skeletal muscle lesions showed degeneration, cellular and calcium salt infiltrations. The heart and kidney lesions were found to be areas of coagulation necrosis and purulent foci. Chemical examination of the white-muscle lesions showed an increase in the calcium and phosphorus present. When large quantities of the heart blood were used for inoculating mediums, cultures were obtained. The significant organisms isolated were divided into three groups according to their morphological characteristics. These were bipolar rods, cocci, and non-spore-forming, rod-shaped organisms. All three of these different forms of organisms reproduced typical symptoms in lambs and rabbits when injected intravenously. Two of these three forms reproduced white-muscle lesions in rabbits. Purulent arthritis was the most common lesion reproduced in both rabbits and lambs by these pure cultures. The history showed that the navel was untreated, and that a hot docking instrument was not used."

Reindeer parasites and parasitic diseases [trans. title], P. HELLESNES (*Norsk Vet. Tidsskr., 47 (1935), Nos. 3, pp. 117–137, figs. 15; 4, pp. 194–204, Eng. abs. pp. 201, 202*).—Notes are presented on the parasites and parasitic affections

of reindeer in Norway, based partly on examinations of slaughtered animals, particularly in different parts of the Jötunheim district. A list is given of 34 references to the literature.

Brucella infection in swine: Studies from an epizootic in Denmark, 1929–1932, A. THOMSEN (*Acta Path. et Microbiol. Scand., Sup. 21 (1934), pp. 253, pls. 27; Fr., Dan. abs., pp. 227–241*).—In the introduction (pp. 11–47) to studies conducted at the State Veterinary Serum Laboratory at Köbenhavn (Copenhagen) in 1929–32, during which time the author was occupied chiefly in combating the *Brucella* epizootic among swine, a survey is given of the *Brucella* group and brucelliasis, based upon experiences and a review of the literature, a 12-page list of which is included (pp. 242–253). The studies, which are reported in 12 chapters, deal, respectively, with (1) infection in the male, (2) infection in the female, (3) brucelliasis outside the genital organs, (4) isolation of *B. suis*, (5) spreading of brucelliasis, (6) the Danish epizootic in 1929–32, (7) diagnosis of *Brucella* infection, (8) combating of *Brucella* infection in swine, (9) relation of swine brucelliasis to infectious abortion in cattle cross-inoculation experiments, (10) special properties of the porcine *Brucella*, (11) pathogenicity of the porcine *Brucella* for man, and (12) name of the disease.

Cases of hog cholera observed in São Paulo [trans. title], A. M. PENHA (*Arch. Inst. Biol.* [*São Paulo*], *5* (*1934*), *pp. 137–141; Eng. abs., p. 141*).—Several cases of hog cholera are said to have been demonstrated in the State of São Paulo through inoculation of susceptible pigs.

Serological studies of swine erysipelas with particular reference to agglutination, H. W. SCHOENING and G. T. CREECH (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 1, pp. 71–79*).—Studies which supplement those previously noted (E. S. R., 69, p. 276) are reported.

Six of eight pigs that were exposed to swine erysipelas infection by injections of cultures of *Erysipelothrix rhusiopathiae* developed agglutinins in the blood detectable from the third to the sixth day after inoculation, which disappeared gradually after some months. The other two pigs, 3 weeks of age, failed to show clinical evidence of infection, and their blood remained consistently negative to all tests for swine erysipelas.

Blood serum from a pig showing typical diamond skin lesions of swine erysipelas from which the *E. rhusiopathiae* was recovered gave negative results to both the plate and tube agglutination tests for swine erysipelas. Negative serological results have been reported in five other similar cases. The reason for such negative results has not been determined.

It was experimentally demonstrated that the subcutaneous injection of 30 cc of anti-swine-erysipelas serum (equine) resulted in the passive transfer of a very large portion of the agglutinins contained in the specific serum to the serum of the injected hog. Another pig injected with 30 cc of normal horse serum remained consistently negative to all tests for swine erysipelas.

Blood serum from a human case, in which the history and clinical symptoms strongly indicated *E. rhusiopathiae* infection, gave definite positive reactions to both the plate and tube tests for swine erysipelas. Human sera from apparently normal individuals gave negative results to the tests.

A whole blood plate test made in the case of a man affected with chronic polyarthritis gave negative results.

A description is given of the technic of a rapid serological method of identifying cultures of *E. rhusiopathiae*.

The occurrence of influenza of swine in the Netherlands [trans. title], J. I. TERPSTRA (*Tijdschr. Diergeneesk.*, *62* (*1935*), *No. 4, pp. 177–186; Ger., Eng.,*

Fr. abs., pp. 185, 186).—The author reports upon a disease of young pigs in the Netherlands which bacteriologically resembles swine influenza as reported upon by Shope from the United States (E. S. R., 65, p. 674; 68, p. 532).

The behavior of the virus of equine encephalomyelitis on the chorioallantoic membrane of the developing chick, E. Higbie and B. Howitt (*Jour. Bact., 29 (1935), No. 4, pp. 399–406, figs. 2*).—The authors find that the "virus of equine encephalomyelitis, both eastern and western strains, may be cultivated upon the chorioallantoic membranes of the developing chick. Inoculated upon the membranes of the egg, the virus may be recovered from the nerve tissues and the amniotic fluid of the embryo after a definite time interval. This progressive invasion is comparable with a growth curve ultimately leading to the death of the embryo. The virus could be recovered from the vitelline vein and from the pooled heart blood of several chick embryos after a definite incubation period. Because of the rapidly lethal effect of the virus upon the embryo, the inoculation of the developing egg offers a simple and inexpensive method for titrating the potency of the virus and for carrying out the in vitro neutralization test."

Mosquito transmission of equine encephalomyelitis, D. E. Madsen and G. F. Knowlton (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5, pp. 662–666*).—In two different attempts at the Utah Experiment Station *Aedes nigromaculis* (Ldw.) was found to transmit equine encephalomyelitis (western type) from affected guinea pigs to pigs not so affected. While most attempts at transmission with *A. dorsalis* Meig. resulted in failure, they indicate that this mosquito also may transmit the disease.

Direct isolation of pasteurella-like microorganisms from brains of horses suffering from so-called cornstalk disease, R. Graham (*Science, 81 (1935), No. 2103, pp. 387, 388*).—In the course of further work (E. S. R., 72, p. 841), the author succeeded through direct cultural methods in isolating pasteurellalike micro-organisms from the brains of eight different horses in Illinois.

Fatal suppurating abscess of the stomach caused by stomach worms (Habronema megastoma), T. Topacio (*Philippine Jour. Anim. Indus., 1 (1934), No. 6, pp. 403–405, pl. 1*).—This is a case report of a 10-year-old Arabian stallion.

The "fixed" virus of rabies: The antigenic value of the virus inactivated by the photodynamic action of methylene-blue and proflavine, I. A. Galloway (*Brit. Jour. Expt. Path., 15 (1934), No. 2, pp. 97–105*).—The author has found that "the 'fixed' virus of rabies is sensitive to the photodynamic action of methylene blue. Under the conditions of the experiments it was inactivated in collodion membrane or sand and paper pulp filtrates, but not in unfiltered virus suspensions. The virus apppears to be relatively more sensitive to the photodynamic action of proflavine than to that of methylene blue, at least in the presence of physiologically active cells or portions of cells from an infected animal. It was inactivated by irradiation when the former dye was employed even in unfiltered virus suspensions of fresh infected brain. Rabies fixed virus inactivated by the photodynamic action of methylene blue or proflavine conserves its antigenic potency, since about 84 percent—26 out of 31 rabbits—which had received more than one dose of such a vaccine survived an intramuscular test dose of fresh virus, while of 16 unvaccinated control animals only 1 survived (percentage survival, 6)."

Studies of total erythrocyte and leucocyte counts of fowls.—I, Repeated erythrocyte and leucocyte counts, E. I. Palmer and J. Biely (*Folia Haematol. [Leipzig], 53 (1935), pp. 143–154*).—The studies here reported were conducted with a view to determining the degree of variation that may be expected in consecutive total red and white cell counts of fowls.

The following consecutive counts were made and the results tabulated: (1) Repeated counts on the same sample of oxalated blood from 4 birds (15

counts); (2) duplicate counts of 50 birds; (3) 4 to 5 daily counts of 12 birds (54 counts); and (4) 4 to 7 hourly counts of 12 birds (72 counts). The results of the first of four experiments reported have shown that the technic devised by A. T. Shaw in 1930 provides a satisfactory method of counting erythrocytes and leucocytes in the same chamber, and, further, that the technic used was sufficiently standardized to secure a reasonably accurate count. It is pointed out that while variations have been found in both the erythrocyte and leucocyte counts of normal birds, the daily consecutive counts and hourly counts of individual birds fluctuated around a certain level characteristic of the individual. The normal range of fluctuation in red cells appears to be about 15 percent.

Studies of total erythrocyte and leucocyte counts of fowls.—II, Effect of 48-hour starvation on total erythrocyte and leucocyte counts, E. I. Palmer and J. Biely (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5, pp. 594–599*).—In the authors' studies, the details of which are given in three tables, "erythrocyte and leucocyte counts were made of three groups of birds previous and subsequent to 48 hr. of starvation. In 31 out of 39 birds an increase in the erythrocyte counts was found, while in 8 there was a decrease. With 1 exception, all birds showed a decrease in the leucocyte counts. The percentage decrease for the three groups was 23.1, 27.7, and 28.3, respectively.

"It is concluded from the data that, in making blood counts, the time interval between the last feeding and the time the counts are made should be taken into consideration. To avoid an obvious source of fluctuation, resulting from partial starvation, a standard procedure with regard to time of feeding and making erythrocyte and leucocyte counts should be followed in the study of normal or diseased fowls."

Diseases of domesticated fowl in São Paulo, Brazil [trans. title], J. and A. S. Reis and P. Nóbrega (*Arch. Inst. Biol. [São Paulo], 5 (1934), pp. 41–49; Eng. abs., pp. 47, 48*).—A report is made of the findings in 1,500 diseased fowl examined at São Paulo in 1930–33.

The survival of avian coccidia in soil, J. P. Delaplane and H. O. Stuart (*Poultry Sci., 14 (1935), No. 2, pp. 67–69*).—In the course of experimental work at the Rhode Island Experiment Station, commenced in 1931, "the oocysts of avian coccidia were found to survive in the soil from experimental plats for a period of from 4 to 9 mo. following the removal of chickens from the ranges. Viable oocysts were found to survive in soil of a wooded range at 15 and 18 (the maximum period tested) mo. following the removal of all chickens. No deaths attributable to coccidiosis were noted from the experimental plats after the first summer, at which time they had been artificially infected."

Avian malaria: Plasmodium gallinaceum n. sp. of the domestic fowl [trans. title], E. Brumpt (*Compt. Rend. Acad. Sci. [Paris], 200 (1935), No. 9, pp. 783–785, fig. 1*).—A plasmodium pathogen first found in the domestic fowl at Nha-trang, French Indochina, in 1910 is described as new under the name *P. gallinaceum*. This form, rarely met with, appears to have been recorded first by Prowazek, who in 1912 reported its occurrence in the domestic fowl of Deli, Sumatra.

The relation of the electric charge of the red cells to phagocytosis in avian malaria, G. M. Findlay and H. C. Brown (*Brit. Jour. Expt. Path., 15 (1934), No. 3, pp. 148–153, figs. 2*).—In a study of avian malaria serum from canaries with a latent malarial infection was found to have a sensitizing action on infected red cells when the number of infected red cells was small in proportion to the amount of sensitizing serum. Blood from a canary recovering from an acute primary attack of malaria produced infection less readily than blood from the same canary at the beginning of the attack, the number of infected

red cells being approximately the same at both times. The electric charge of the red cells was shown during an attack of avian malaria to be correlated with the size of the spleen and with the phagocytosis rate of infected red cells by the macrophages of the spleen.

The etiology of epidemic colds in chickens, C. S. GIBBS (*Science, 81 (1935), No. 2101, pp. 345, 346*).—Following a brief reference to the literature relating to this affection, the author reports upon outbreaks studied at the Massachusetts Experiment Station. Tracheal exudates from two outbreaks in which hemophilic micro-organisms could not be isolated were examined by means of a series of graded acetic-celloidin filters. The causative agent passed through these filters and was transmitted directly to healthy chickens by intranasal and intratracheal inoculation. While there is no satisfactory standard for measuring the size of the pores in the filters through which the virus passed, it is estimated that the diameter of the coryza virus particles must be between 80 and 120 mμ.

The resistance of the virus of infectious laryngotracheitis to certain physical and chemical factors, O. W. SCHALM and J. R. BEACH (*Jour. Infect. Diseases, 56 (1935), No. 2, pp. 210–223*).—The authors have found the virus of infectious laryngotracheitis in tracheal exudate in the bodies of dead fowls kept at incubator, room, and refrigerator temperature to survive as follows: "At 37° C. for 22 but not 44 hr., at 13° to 23° for 10 but not 15 days, and at 4° to 10° for 30 but not 60 days. Virus in tracheal exudate kept in the dark at room temperature decreased only slightly in virulence during the first 75 days, after which deterioration proceeded more rapidly, for it was nearly avirulent after 110 days. Virus in tracheal exudate exposed to direct sunlight showed no decrease in virulence during 6 hours' exposure of one trial, but in a second trial the virulence was lost in 7 hr. Virus in tracheal exudate suspended in 50 percent glycerine-phosphate buffer solution of pH 6.5, 7.0, 7.4, or 8.0 persisted longest at the pH value of 7.4. The suspensions at pH 6.5, 7.0, and 8.0 were innocuous after 75 days in one trial and 131 days in another, while the suspension at pH 7.4 in each instance was still infective.

"Virus in tracheal exudate desiccated by Swift's method and stored in the refrigerator retained virulence for periods of time varying from 298 to 661 days. In exudate desiccated in vacuo over calcium chloride at refrigerator temperature and stored in the refrigerator, virulence persisted for periods varying from 100 to 371 days. Virus in desiccated tracheal exudate held in the dark at incubator, room, and refrigerator temperature survived as follows: At 37° for 7 but not 14 days, at 16° to 24.5° for 35 but not 42 days, and at 4° to 10° for as long as 217 days. Similar results were obtained with virus in tracheal exudate suspended in glycerine. Virus in tracheal exudate preserved by desiccation remained virulent longer, in 6 out of 8 trials, than a portion of the same virus in undesiccated exudate preserved by suspension in 50 percent glycerine.

"Virus in tracheal exudate exposed to heat in a water bath retained virulence at 55.5° for 10 but not 15 min., at 60° for 2 but not 3 min., and at 75° for 15 but not 30 sec. Virus in tracheal exudate suspended in buffered 50 percent glycerine at pH 7.4 containing 0.5 percent phenol survived for 150 days in one trial, for 100 days in another, and was avirulent after 35 days in a third trial. Virus in tracheal exudate was inactivated by 1-min. exposure to a 5 percent solution of phenol and by 0.5-min. exposure to a 3 percent solution of compound solution of cresol and 1 percent solution of sodium hydroxide."

Newcastle disease of fowls, T. M. DOYLE (*Jour. Compar. Path. and Ther., 48 (1935), No. 1, pp. 1–20*).—In this contribution, presented with a list of 27 refer-

ences to the literature, the author records the identification of Newcastle disease in England, the Dutch East Indies, the Philippine Islands, India, Ceylon, Chosen (Korea), Japan, and Australia. "The English, Dutch, Philippine, Indian, Korean, and Japanese strains of the virus have been proved to be immunologically indistinguishable. Newcastle disease is a separate entity, bearing a superficial resemblance to fowl plague, but differing from it in the period of incubation, symptoms, lesions, infectivity, pathogenicity for pigeons, and on immunological grounds. The wide distribution of the disease, its high infectivity, and its great virulence render it a serious menace to all countries in which poultry farming is extensively practiced. Manninger's contention [E. S. R., 73, p. 99] that the rapid serial passage of Newcastle virus through fowls reduces the period of incubation and gradually renders the infection indistinguishable from plague could not be confirmed."

Blood studies of strains of the domestic fowl differing in resistance to pullorum disease, J. H. Quisenberry, E. Roberts, and L. E. Card (*Poultry Sci., 14 (1935), No. 1, pp. 63, 64*).—Counts of the erythrocytes, leucocytes, and polymorphonuclear neutrophiles of the blood of chicks of susceptible and resistant strains made in the course of a study of the possible causes of the difference in their resistance to infection by *Salmonella pullorum* are reported. The findings in inoculated and uninoculated chicks 3 to 9 days old are given in tables.

It is thought that the difference between the percentage of neutrophiles of the inoculated susceptibles and resistants may be of use as a measure of the difference in resistance of the two strains of chickens.

The place of the whole-blood test in a pullorum disease-eradication program, R. E. Lubbehusen and J. R. Beach (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 5, pp. 620–634*).—A more detailed account is given of work with the whole blood test than that previously noted (E. S. R., 73, p. 109).

Prevention of pullorum disease in São Paulo [trans. title], J. and A. S. Reis (*Arch. Inst. Biol. [São Paulo], 5 (1934), pp. 51–53; Eng. abs., p. 53*).—Eradication and control work with pullorum disease in São Paulo is reported upon.

Preliminary studies in fowl spirochaetosis in Egypt, Z. Morcos (*Vet. Jour., 91 (1935), No. 4, pp. 161–171*).—The author has found that "(1) a chronic form of spirochetosis occurs among European-bred fowls reared in Egypt, associated with the presence of small intracellular pink staining bodies, and when the condition of the bird is lowered free spirochetes are seen in the blood. (2) Piroplasmosis of fowls [*Aegyptianella*] *pullorum* is totally different from any form of spirochetosis on microscopic examination (Balfour's bodies are identical to [*A.*] *pullorum*). (3) Liver and spleen emulsion taken from fowls suffering from spirochetosis and treated by formalin is a promising antigen for protection. (4) Piroblue or atoxyl, or both, are useful drugs for the treatment of avian spirochetosis and piroplasmosis. (5) Egyptian-bred pigeons and fowls are resistant to spirochetosis through hereditary resistance, while crossbred fowls are fairly susceptible."

Avian tuberculosis: Collected studies, A. F. Schalk, L. M. Roderick, H. L. Foust, and G. S. Harshfield (*North Dakota Sta. Bul. 279 (1935), pp. 46, fig. 1*).—A series of experiments outlined in a comprehensive project on avian tuberculosis organized in 1923 and continued since that time is reported upon. The investigational work was primarily limited to three types of the tuberculosis problem, namely, (1) a study of the invasiveness and pathogenesis of *Mycobacterium tuberculosis avium* for cattle and hogs, including a study of tuberculosis infection in sheep presented as a separate article by Harshfield and

Roderick (E. S. R., 72, p. 388); (2) the possibility of pigeons, sparrows, mice, and rats serving to introduce the infection into healthy flocks either as infected animals or as mechanical carriers; and (3) the longevity of the avian type of the infection under natural conditions in soil, in manure, and in decomposing carcasses.

It was found that "a large proportion of the cattle which are exposed to tuberculous chickens develop a 'hypersensitiveness of infection' and will react to avian tuberculin but not with the tuberculin which is used in the routine testing of cattle for bovine tuberculosis. Minimal quantities of the avian tubercle bacilli are capable of provoking that condition of hypersensitiveness, but it is seldom . . . that the infection develops to a point where it can be detected by the usual methods of examination, nor can gross evidence of disease be found except on rare occasions. The sensitivity of such cattle to avian tuberculin disappears within a few months after the termination of the exposure to the tuberculous fowls. The failure, therefore, to find visible lesions of tuberculosis on autopsy of cattle which have been condemned because of positive tuberculin tests in routine eradication work cannot be attributed to a previous exposure of those animals to tuberculous chickens. . . .

"A nominal amount of work revealed a conspicuous morbidity from avian tuberculosis in swine in North Dakota. The disease is readily transmissible to swine by way of the digestive tract, and exposure results in a large proportion of infections. The frequency of the occurrence of avian tuberculosis in swine is correlated, therefore, with the morbidity of the disease in fowls on a given farm, and emphasizes the need for separate enclosures for swine and poultry and the sanitary management of hog lots and poultry yards. The destruction of the offal of tuberculous poultry and its elimination from garbage so that it is not consumed by hogs or poultry will erect another barrier to the spread of the infection.

"Pigeons and sparrows were found capable of carrying the infection in a mechanical way. A nominal amount of tuberculosis was found in pigeons and sparrows captured for experimental purposes, and such birds are a menace to poultry. These birds did not appear especially susceptible to the infection under the conditions of experimental exposure.

"Common rats, house mice, and field mice were found to be extremely resistant to avian infection. White rats, on the other hand, were found to be mildly susceptible to the infection. The common rats were found capable, under experimental conditions, of serving as mechanical carriers of the infection.

"Avian tuberculosis is primarily a disease of the digestive tract in fowls. The organism is present in the feces of a large proportion of infected fowls, although a part of this volume of infection was shown to have originated in the liver. A bacteriemia and a generalization of the tuberculous infection is common and seems to occur rather early in the course of the disease.

"The avian tubercle bacillus survives unusually well in nature outside the body of the fowl. It remained viable at a depth of 3 ft. for at least 27 mo. after burial of infected carcasses. The tubercle bacillus was still viable and pathogenic in the litter and soil of the experimental cage barnyard after practically 4 yr. Tuberculosis in fowls, as in animals, is ordinarily a slowly progressive disease, yet young chicks were found quite susceptible."

A list is given of 23 references to the literature.

The propagation of the virus of vesicular stomatitis in the chorio-allantoic membrane of the developing hen's egg, F. M. Burnet and I. A. Galloway (*Brit. Jour. Expt. Path., 15 (1934), No. 2, pp. 105–113*).—In work at the National Institute for Medical Research in London both the so-called

"*Indiana*" *and* "*New Jersey*" *strains of virus have been propagated in the* chorioallantoic membrane of developing hen's eggs. "The types of reactions produced in inoculated eggs are described, as well as the histology of the lesions. In certain cases the virus may be recovered not only from the chorioallantoic membrane but also from the brain, skin, and liver of the embryo. It has been found possible to employ the egg inoculation technic for *the testing of immune sera and determining the identity of the two immuno*logically different strains of virus. Doses of virus which produce no reactions in guinea pigs may produce lesions in eggs from which virus can be recovered by subinoculation into guinea pigs. The virus is relatively sensitive to the photodynamic action of methylene blue. Irradiated mixtures which give no lesions when inoculated into guinea pigs are also inactivated for eggs."

Blackhead (entero-hepatitis) investigations, J. P. Delaplane and H. O. Stuart (*Rhode Island Sta. Bul. 247 (1935), pp. 16*).—This is a summary of information on blackhead based upon a review of the literature, a list of 33 references to which is included, and work at the station (E. S. R., 66, p. 775; 69, p. 863).

Experiments conducted "to determine the incidence of blackhead in turkeys reared in confinement in contrast to those reared on range and to note the amount of feed consumed under the two methods indicated that Bronze-Narragansett cross birds consumed on an average of 58.66 lb. of feed in confinement over a 25-week period, while those reared on range consumed on an average of 58.00 lb. over a corresponding period. The average weight of the confinement group birds was 13.32 lb. as against 12.37 lb. for the range group at the end of the twenty-fifth week. As both groups of birds were reduced in numbers through accident and disease, figures were available from only a limited number of birds in each group.

"A survey of the sanitary methods used by Rhode Islands turkey producers showed that practically all followed a sanitation program which was quite satisfactory in controlling blackhead infection."

Cytology of the blood of normal mink and raccoon, I–III, A. H. Kennedy (*Canad. Jour. Res., 12 (1935), No. 4, pp. 479–507, pls. 2*).—The author's study of the morphology and number of blood cells occurring in normal mink and raccoon, determined in order to establish normal standards for various periods during the life of these animals, is reported in three parts—I, Morphology of Mink's Blood (pp. 479–483), II, The Numbers of the Blood Elements in Normal Mink (pp. 484–494), and III, Morphology and Numbers of the Blood Elements in Raccoon (pp. 495–507). It is pointed out that these standards are desirable for comparative purposes when determining the extent of pathological blood changes which may take place during the course of nutritional or parasitic diseases.

The differential blood changes in ascariasis in foxes, A. H. Kennedy and R. G. Law (*Canad. Jour. Res., 12 (1935), No. 3, pp. 277–285, figs. 10*).—Definite and characteristic changes were found to occur in the proportions of basophiles, neutrophiles, and lymphocyte cells in the blood of foxes 10 to 12 weeks of age that had orally received embryonated eggs of *Toxascaris leonina* in a small quantity of water through the stomach tube.

"The numbers of red blood cells and the amounts of hemoglobin remained within normal limits, but the proportion of basophiles rose as high as 69.5 percent of the total leucocyte count. This increase is apparently associated with the number of eggs given, the largest dose producing the highest proportions. The proportions of neutrophiles and leucocytes tended to fluctuate in opposite directions. An increase in the total numbers of white blood cells appears to be influenced by an increase in the proportion of basophiles."

Tuberculinization of silver foxes [trans. title] (*Tijdschr. Diergeneesk., 62 (1935), No. 6, pp. 313, 314; Ger., Eng., Fr. abs., p. 314*).—The tuberculin test for silver foxes by the subcutaneous method is said to be unreliable, since the body temperature of this species is extremely labile.

AGRICULTURAL ENGINEERING

Erosion control and the cultivation of hillsides [trans. title], A. PIÉDALLU (*Jour. Agr. Prat., 99 (1935), No. 6, pp. 128–131, figs. 5*).—Technical information and drawings are presented relating to French practice in the terracing of steep hillside lands and the conservation of run-off water between terraces. The practices include rather heavy levee construction of both soil and masonry and blasting the subsoil of the terrace ditches to increase moisture absorption.

New power equipment for terracing, M. L. NICHOLS and R. E. YODER (*Agr. Engin., 16 (1935), No. 3, pp. 93–96, 102, figs. 9*).—In a contribution from the Alabama Experiment Station new types of power equipment for terracing are described which in general represent adaptations of conventional road-grading equipment to the job of terracing.

Agricultural explosives [trans. title], C. HOUDAYER (*Jour. Agr. Prat., 99 (1935), No. 2, pp. 38–42, figs. 7*).—Technical information is presented relating to French practice in the use of explosives for preparing holes for the planting of fruit trees.

Compact data for checking oil burner combustion, F. G. SEFING (*Heating and Ventilating, 32 (1935), No. 3, pp. 17, 18, fig. 1*).—Graphic data are presented which permit the checking of oil-burner combustion using only a thermometer and a carbon dioxide analyzer.

Requirements of farm machinery for terraced land, R. W. BAIRD (*Agr. Engin., 16 (1935), No. 3, pp. 97, 98, figs. 2*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering the requirements of farm machinery for terraced land are summarized to include (1) flexibility in a vertical plane to allow for the unevenness of the ground surface, (2) compactness longitudinally, to follow crooked rows and reduce the effect of an uneven ground surface, (3) positive steering, (4) wheels and lugs designed to reduce creep as much as possible, (5) a low center of gravity, and (6) selection of widths that will make the operation of the tractor on the steepest part of the ridge unnecessary.

Methods of testing drivewheels and tracks, A. W. CLYDE (*Agr. Engin., 16 (1935), No. 2, pp. 55, 56, 60, figs. 6*).—In a contribution from the Pennsylvania Experiment Station an effort is made to lay down a rational procedure for testing tractor drivewheels and tracks based upon studies at the station and at several other stations.

It is pointed out that in order to study a wheel or track the data which should be secured for various pulls should include (1) input force or tractive force on the wheel or track sprocket at the no-load rolling radius or rim as selected, (2) drawbar pull or output force, and (3) slippage or travel efficiency.

Tests at the station with steel wheels, pneumatic tires, and an experimental cushion rubber tire were made on a level course of silt loam soil. The zero-pressure tires were weighted so that they had the same static axle load as the pneumatics with one pair of weights.

At light pulls the over-all efficiencies were about the same. Above a 900-lb. pull the efficiency of the lighter loaded wheels fell off sharply because of slippage, while the heavier loaded wheels went to about 1,500 lb. before their

efficiency fell off. At 16 percent slip, which occurred at maximum over-all efficiency, the pulls were 1,380 and 910 lb. Additional weight of 945 lb. therefore increased the pull 470 lb. at this slip, or about 50 percent of the added weight.

With the exception of sod, the differences between pneumatics and zero pressures are of little significance because most of the differences are within the limits of accuracy of the measurements.

These results are taken to indicate the importance of reducing the rolling resistance of steel wheels without too much slippage, of reducing the slippage of rubber tires without objectionable increases in weight, and of reducing the cost of track manufacture.

The conclusion also is drawn that inlet manifold vacuum is a very unreliable and time-consuming method of getting engine torque, to say nothing of wheel torque. A method of securing torque at the drive axle is described.

Strength testing procedure for the agricultural implement type of spoked wheel, O. B. ZIMMERMAN (*Agr. Engin., 16 (1935), No. 3, pp. 103–109, figs. 12*).—In a further contribution to the subject (E. S. R., 72, p. 851), laboratory methods are discussed which have for their objective the development of a standardized practice in wheel design production and testing. These include both static and dynamic tests of assembled units, the prime group stresses to be observed being those resulting from radial load, side thrust, torsion, pivot, and internal stress.

Typical test data are reviewed to visualize the resistance of a wheel to the various major stresses.

Pneumatic tractor tires on listed crop ridges, F. J. ZINK (*Agr. Engin., 16 (1935), No. 2, pp. 57–60, figs. 5*).—Studies conducted at the Kansas Experiment Station are reported which related to (1) row spacing and tractor-wheel tread width, (2) inflation of tires, different sizes of tires, and tire treads, (3) steering control and steering brakes of tractors, (4) flattening ridge tops by rolling and leveling, (5) guide-wheel attachments and guide coulter wheels, (6) wide-base, drop-center rims, (7) tire chains, and (8) guide flange on wheel.

It is concluded that in order to reduce the instability of tractor operation on listed ridges with pneumatic tires the rows should be spaced 42 in., with the spacing as consistent as possible. Tractor tread width should be twice the row spacing. Under difficult conditions lug type chains should be used. Wheel flanges, both front and rear, appear as the best ultimate solution of the problem of steering control. Rolling and dragging ridge tops was found to be helpful.

Application of rubber tires to combines, I. D. MAYER (*Agr. Engin., 16 (1935), No. 2, pp. 53, 54, 60, figs. 4*).—This is a progress report of one season's studies at the Indiana Experiment Station on the use of low-pressure pneumatic tires on a combine. The equipment used in these tests consisted of a McCormick-Deering No. 20 combine (8-ft. cut) with auxiliary motor and an F–20 Farmall tractor. No alterations other than the wheel equipment were made upon the combine or the tractor. The tires used were of standard sizes and as nearly as possible the same diameter as the steel-wheel equipment replaced.

The tentative conclusion is that the use of low-pressure pneumatic tires on combines offers the advantages of reduced vibration, lower drawbar pull which might in some cases permit the use of smaller tractors, lower fuel consumption, greater comfort for the operators, and much easier transportation on the highways. It appears that the greatest disadvantage of rubber-wheel equip-

ment for combines are the increased cost of the equipment and the hazards of punctures.

Orchard tillage under straight-furrow irrigation, C. A. Taylor (*Agr. Engin., 16 (1935), No. 3, pp. 99–102, figs. 2*).—In a contribution from the U. S. D. A. Bureau of Agricultural Engineering data are presented which indicate that changed ideas concerning the fundamental requirements of orchard cultivation have necessitated changes in implements used to perform orchard tillage operations. There are many orchard operations that conflict, and careful planning is required to bring tillage into accord with all other phases of the orchard program. Disks must be designed to give the maximum cutting action on cover crops with uniform and shallow penetration. Under straight-furrow irrigation the control of weeds and the preparation of furrows for irrigation can be combined into one operation. This makes the use of permanent furrows feasible, and they can be made broad and shallow so that more of the fertile top soil is available to feeder roots. Water can be spread over the land more uniformly, and a high degree of efficiency in irrigation can be obtained. When this is accomplished the problems due to overirrigation are automatically taken care of. Rainfall is conserved by diverting the run-off from the more compacted soil and spreading it onto the more absorptive area along the tree lines. This aids in the control of erosion and leads to a more permanent agriculture.

Precooling fresh fruits in refrigerator cars, F. C. Gaylord, K. I. Fawcett, and T. E. Hienton (*Agr. Engin., 16 (1935), No. 3, pp. 113–115, figs. 2*).—Studies conducted by the Indiana Experiment Station on the precooling of cantaloups, peaches, and strawberries are reported. A total of 19 cars of cantaloups, 3 cars of strawberries, and 4 cars of peaches were precooled during these tests, using three different fans. Temperatures were taken at 10 points in the car by means of thermocouples and potentiometer. The temperatures were all taken at 5 points in one end of the car equidistant from the middle to the end of the car in the top and bottom center rows of crates or baskets. The ends of the thermocouples were inserted into the centers of the fruit being precooled. In the case of peaches the temperatures were taken as nearly as possible at the centers of the baskets.

Tests made with 6 fans blowing air into the tops of the ice bunkers to increase the natural air movements showed that cooling was faster in the bottoms of the loads than in the tops. The favorable effect on rate of cooling by use of salt on the ice was shown. A comparison of this car with cars which were not precooled showed that the entire lading of the precooled car cooled faster than those in the cars where fans were not used.

When fans were installed so that the natural movements of the air in the car were reversed, that is, the cold air came out of the top bunker openings instead of the bottom openings, the top of the lading cooled much more rapidly than the bottom. This is desirable, as records show that the bottom of the lading cools first while the top cools much more slowly when cars are shipped without precooling.

Using 6 fans, temperature drops were 10.8° and 4.2° for top and bottom, respectively, while with 10 fans similar results were 18.0° and 3.2°. The importance of bunkers being nearly full when the fans are started is shown by the difference in results obtained on cars with ice down 24 in. with those obtained on cars with ice down 40 in. or more. It would seem that bunkers should be nearly full when precooling is started to insure maximum reduction in temperatures.

AGRICULTURAL ECONOMICS

Procedure for rapid calculation of multiple correlation coefficients, G. N. Stroman (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 1, pp. 59–69*).—Some short cuts in using the Wallace and Snedecor machine methods (E. S. R., 66, p. 586) are described. "These short methods of calculation reduce the time necessary to obtain the multiple correlation coefficients and give a higher degree of accuracy to the work."

Proceedings [of the] sixty-seventh convention of California Fruit Growers and Farmers (*Calif. Dept. Agr. Mo. Bul.*, *24* (*1935*), *No. 1, pp. 170*).—Included among others are the following papers with discussions, presented at *the sixty-seventh convention held at Riverside, Calif., December 18–20, 1934*: Farm Debt Adjustment, by R. V. Garrod (pp. 21–29); Agricultural Adjustment—What Next? by C. B. Hutchison (pp. 29–36); What the Farmers Tell Us, by W. F. Eldridge (pp. 37–40); Farm Credit Accomplishments, by E. A. Stokdyk (pp. 40–45); The Federal Subsistence Homestead Plan, by R. H. Gast (pp. 45–50); Rural Rehabilitation, by H. E. Drobish (pp. 50–56); The Present Status of and Need for Land-Use Planning, by A. de Fremery (pp. 56–58); The Effects of Regulation on the Sale of Dairy Products, by S. H. Greene (pp. 62–65); Sales Protection for California Growers—A Discussion of Marketing Laws and Their Application, by C. J. Carey (pp. 65–76); New Legal Concepts Under Relief Type of Legislation, by B. McDaniel (pp. 76–91); California Agricultural Prorate Law—Difficulties of Enforcement, by A. J. McFadden (pp. 97–101); The Value of Standardization, by H. Bishop (pp. 101–106); Marketing Competition in Vegetables, by C. B. Moore (pp. 107–112); The Avocado Marketing Program, by C. V. Newman (pp. 112–115); Marketing Progress in Walnuts, by A. W. Christie (pp. 115–118); The Citrus Marketing Situation, by P. S. Armstrong (pp. 119–121); Present Day Marketing of Deciduous Fruits, by F. W. Read (pp. 122–128); The Fruit Deal in California, by H. H. Warner (pp. 128–138); Future Needs of Agriculture, by G. Sehlmeyer (pp. 139–143); What Is Facing the Hay, Grain, and Feed Markets, by G. McDowell (pp. 143, 144); Live Stock Marketing Prospects, by W. A. Freeman (pp. 144–148); The Effects of Reciprocal Trade Agreements on California Agriculture, by R. L. Adams (pp. 148–151); Wool Growers' Problems in the Marketing Field, by W. P. Wing (pp. 151–155); The Dairy Products Market Situation, by E. Maharg (pp. 155–157); and What Will Improve the General Poultry Situation? by H. W. Amelung (pp. 158–160).

[Investigations in agricultural economics by the Storrs Station, 1934] ([*Connecticut*] *Storrs Sta. Bul. 199* (*1934*), *pp. 3–8*).—Studies made in cooperation with the Federal Civil Works Administration are reported on briefly as follows: (1) Some data are given as to average size and value of farm, equipment, farm expenses, net contribution of farm to family living, etc., as shown by 1,779 records for part-time farms in 36 towns of the State; (2) a table comparing the number of farms and acreage delinquent in current taxes and the amount of such delinquency in 1928 and 1932 in 139 towns surveyed; and (3) a table comparing in 2 towns the total sales value and total assessed value of farms with sales values of 0–$2,000, $2,001–$4,000, and above $4,000.

Current Farm Economics, Oklahoma, [April 1935] (*Oklahoma Sta., Cur. Farm Econ.*, *8* (*1935*), *No. 2, pp. 25–47, figs. 2*).—Included besides the usual tables of indexes of prices and purchasing power of farm products and demand deposits in Oklahoma are reviews of the industrial and cotton situations, by L. S. Ellis; the wheat situation, by R. A. Ballinger; and the sheep and wool situation, by A. W. Jacob; and articles on farm credit and its use and Stillwater

sales-day checks cashed in and near Stillwater, by Ellis; on changes in numbers of livestock during 1934 and how much credit can a farmer afford to use, by P. Nelson; and on community sales days in Oklahoma, by Ballinger and H. J. James.

National Resources Board Report, December 1, 1934 (*Washington: Govt., 1934, pp. VII+455, [pls. 33], figs. [111]*).—This is a report on national planning and public works in relation to natural resources and including land use and water resources with findings and recommendations. Included are the findings and recommendations of the board on planning our natural resources, public-works planning, State and regional planning, basic data for planning, and a plan for planning; and reports of the Land Planning Committee covering conditions and tendencies influencing major land requirements, land requirements in relation to land resources for the Nation as a whole, maladjustments in land use and in the relation of our population to land, and proposed lines of action; of the Water Planning Committee covering principles and policies of use and control of water resources, inventory and use of water resources, and special aspects of water problems; of the Planning Committee for Mineral Policy covering the need of a national policy, policy in the domestic field, and international aspects of mineral policy; and of the Board of Surveys and Maps on the national mapping plan.

Land economics, 1933–1934, compiled by O. Cummings (*California Sta., 1935, pp. [1]+34*).—This is an annotated bibliography of "outstanding references relating to land economics, especially to the present national land policy." It is divided into three sections—general; present national land program, including subsistence homesteads, Tennessee Valley Authority, rural rehabilitation, and public domain; and bibliographies.

Semi-annual index of farm real estate values in Ohio, July 1 to December 31, 1934, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 77 (1935), pp. [5]*).—This is a continuation of the series previously noted (E. S. R., 72, p. 404).

Land problems of India, R. Mukerjee (*London: Longmans, Green & Co., 1933, pp. X+369*).—These Calcutta University readership lectures deal "with land problems as a part of economic history", and show "the bearings of the status and proprietorship of land on the whole agricultural problem, as well as on national finance and taxation." The subject matter is dealt with under the following chapter headings: Agrarian unsettlement, origins of communal land ownership, the landlord tenures, break-up of the village community, fractionalization of holdings, protection of peasant farming, the chain of subinfeudation, absentee landlordism—forms of rent and irregular exaction, defects of tenancy, reform of tenancy, the state as landlord, the agricultural laborer, the landless peasant, agricultural indebtedness and land alienation, the food position in famine and normal years, taxation of agricultural income, and retrospect and forecast.

Recent trends and events in the agriculture of Latin America, P. R. Kelbaugh (*Bul. Pan Amer. Union, 69 (1935), No. 3, pp. 212–229, figs. 6*).—Some of the more prominent trends and more salient events and problems in the agriculture of Latin America are discussed in sections on economic nationalism, break-down of one-crop systems, the case of wheat in Latin America, need for trained agricultural scientists, extension services, agricultural credit, and agricultural cooperatives.

[Economics of the farm business], T. Brinkmann (In *Grundriss der Sozialökonomik, VII. Tübingen: J. C. B. Mohr (Paul Siebeck), 1922, pt. 7, pp. 27–124, fig. 1. Berkeley, Calif.: Univ. Calif. Press, 1935, Eng. ed., pp. X+172,*

fig. 1).—Chapter 1 (pp. 1–6) is a general consideration of the types of farming. Chapter 2 (pp. 7–60) deals with the levels of intensity in agricultural production and the orientation of its location in sections on margins of profitableness and factors of intensity, the economic location of farms as a factor of intensity, the natural location of farms as a factor of intensity, changes in the intensity of farming under the influence of a progressing economic development, and the personal qualities of the agricultural entrepreneur as a factor of intensity. Chapter 3 (pp. 61–163) deals with systems of farming or the orientation of the locations of the lines of production in sections on general consideration of the origin of farming systems, the interrelationships between the enterprises on the farm or the necessity for diversification of its production, the adjustment of production to the economic locations of farms (the zones of Thünen), adjustment of the location of production to the natural conditions of farms, influence of the farmer's personal qualities upon the location of production, the position of the processing enterprises, especially livestock, on the farm, and their locational orientation, and shifts in the location of production with progressing economic development.

[Profitableness of farming in Scotland] (*Edinburgh: Dept. Agr. Scotland, 1934, pp. 56*).—This report continues the series previously noted (E. S. R., 71, p. 119). Of the 198 farms, 127 were included in the report for the year 1930–31.

Value and cost of water for irrigation in the coastal plain of southern California, F. ADAMS and M. R. HUBERTY (*Calif. Dept. Pub. Works, Div. Water Resources Bul. 43 (1933), pp. 189, pls. 3, figs. 2*).—This report is one of a series on the southern coastal plain—coastal area of Los Angeles, Riverside, San Bernardino, and Orange Counties. The present study also includes Ventura and San Diego Counties. It is based on approximately 100 records of cost of production and yield obtained by the extension service of the University of California, 3- to 5-yr. records for approximately 900 citrus groves furnished by the California Citrus League, records of yields and prices furnished by over 60 local citrus packing houses, similar data for walnut packing houses furnished by the California Walnut Growers' Association, and data as to frost hazards, cultural and economic problems, crop acreage, costs of irrigation, etc., from Federal and State agencies. The distribution, acreage, costs of production, yields, and income from citrus fruits, avocados, walnuts, deciduous fruits, grapes, field crops, and truck crops are analyzed. The section was divided on the basis of physical and climatical conditions, water supply, etc., into 15 areas for oranges, 7 for lemons, and 4 for walnuts. The costs of irrigation water as shown by production records, records of irrigation companies and districts, and the costs of producing and distributing water under typical companies and in relation to quantity used are analyzed. The areas available for the extension of agriculture in the section studied and the considerations governing expenditures for irrigation water are discussed.

Spring and winter wheat on the Columbia Plateau, V. ROTERUS (*Econ. Geogr., 10 (1934), No. 4, pp. 368–373, figs. 4*).—Analysis is made of some of the factors—elevation, rainfall, etc.—affecting the allocation of land to winter and spring wheat in the Columbia Plateau in Oregon, Washington, and Idaho.

The author states that "an investigation of the allocation of land to spring and winter wheat in the Columbia Plateau illustrates a common fallacy of broad regional studies. In such studies the facts of locality, of subtle differences within a region, are often obscured by generalized treatment. Hence on somewhat closer examination a speciously homogeneous region is found to have apparently contradictory adjustments to the general scheme of environmental elements."

Cattle and beef survey: A summary of production and trade in British Empire and foreign countries (*London: Imp. Econ. Com., 1934, pp. 367, pls. 6*).—Statistics are given and discussed showing by countries over periods of years the cattle population, the slaughtering, production, and consumption of beef and veal, exports and imports of cattle and beef, destination of exports, origin of imports, etc. The countries are grouped as to whether they have export surpluses or import requirements and also as to whether part of the British Empire. The course of beef prices, 1905–33, and the seasonal variations are discussed briefly.

Eggs and poultry: Report of reorganisation commission for England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 42 (1935), pp. VIII+211, figs. 7*).—This is a report of the committee appointed October 9, 1933, by the Minister of Agriculture and Fisheries to prepare "a scheme or schemes applicable in England and Wales for regulating the marketing of eggs and poultry."

The present position in marketing eggs and poultry—supplies, prices, marketing, etc.— is described and discussed, and the plans for reorganizing the marketing of the two products and the administration of the scheme outlined and discussed. Supplementary matters, such as processing, feeding stuffs, utilization of byproducts, egg marking problems, stock improvement, research into and control of disease, etc., are briefly discussed.

The draft scheme under the Agricultural Marketing Acts, 1931–33, regulating the marketing of eggs and poultry, is included.

Notes on prices of agricultural commodities in the United States and Canada, 1850–1934, H. MICHELL (*Canad. Jour. Econ. and Polit. Sci., 1 (1935), No. 2, pp. 269–279, fig. 1*).—Tables and charts show the prices (averages of 5-yr. periods) of wheat (also Great Britain, 1850–1929), oats, barley, rye, eggs, butter, and cheese in the United States and Canada, 1850–1934, assembled in a study made for the Carnegie Endowment for International Peace. Notes on the major influences determining the general trends of these prices are included.

Butterfat price differentials for fluid milk, F. M. HYRE (*Rhode Island Sta. Bul. 248 (1935), pp. 18, figs. 7*).—This study, which is based on Dairy Herd Improvement Association records for 1,093 individual cows, was made to determine the relationship between the butterfat content and the feed cost per 100 lb. of milk. The butterfat tests ranged from 2.4 percent to 6 percent, averaging 3.7 percent, with the majority between 3 and 4 percent. Tables and charts show the relation between butterfat test and pounds of milk per cow; butterfat test and pounds of silage, hay, beet pulp, and grain feed per 100 lb. of milk; and butterfat test and feed cost in percentage of the feed cost for 3.7 percent milk. Other tables compare the cost of milk with different percentages of butterfat in Rhode Island and other sections; the trends in milk prices in Providence, R. I., and the wholesale price of 92-score butterfat in Boston, January 1, 1926, to January 1, 1934, inclusive; and the base prices of 3.5 percent milk and the butterfat differentials in different cities of the United States June 1934.

Pounds of milk per cow decreased from 8,900 with 3 percent butterfat to 5,304 with 5 percent butterfat. The amounts of feed fed per 100 lb. of milk for 2.9 and 5 percent milk were silage and other grain fed in terms of silage 52 and 104 lb., hay 41 and 57 lb., beet pulp 4.9 and 12.1 lb., and grain 36 and 42 lb. The feed cost in percentage of such cost for 3.7 percent milk was 85.9 percent for 2.9 percent milk and 123.9 percent for 5 percent milk. Using the price for 3.7 percent milk as the base price, the study showed that a butterfat price differential per point (0.1 percent) equal to 1.8 percent of the base price is

required to give producers returns in proportion to feed cost. The differentials for class I and class II milk should be figured separately on the price for 3.7 percent milk in each case.

Crops and Markets, [March–April 1935] (*U. S. Dept. Agr., Crops and Markets, 12 (1935), Nos. 3, pp. 73–104, figs. 3; 4, pp. 105–144, figs. 3*).—Included are tables, charts, reports, summaries, etc., of the usual type covering crop and livestock estimates, marketing reports, and the price situation. No. 3 also includes tables showing by States for different field and truck crops the acreages planted 1933–34, harvested 1932–34, and indicated for harvest in 1935.

Farm Credit Administration (*New York: Amer. Inst. Banking, 1934, pp. 478, figs. 13*).—This is a textbook prepared for the American Institute of Banking by W. I. Myers for use in studying the organization, operation, and management of the Farm Credit Administration. The several chapters cover agricultural production and its effect on credit, farm credit prior to 1933, coordination and centralization of organizations, farm mortgage facilities, Federal intermediate credit banks, production credit corporations and associations, banks for cooperatives, farm mortgage loan procedure and experience, production credit loan procedure, procedure for loans to cooperatives, commercial credit and its relation to farm credit, agricultural mortgage credit in Germany and Denmark, and emergency measures affecting farm credit.

Bank failures in Arkansas, F. L. Garlock and B. M. Gile (*Arkansas Sta. Bul. 315 (1935), pp. 78, figs. 28*).—This study, begun in the fall of 1932 in cooperation with the Bureau of Agricultural Economics, U. S. D. A., was made at the request of the Arkansas Bankers' Association to determine the causes of banking difficulties with a view to suggesting steps to prevent the repetition of such difficulties.

"The general plan of the study was to compare over a considerable period of time the operating policies and financial conditions of banks which survived the depression with those of banks which were closed in 1930, 1931, and 1932. Special emphasis has been placed on reserve, loan, and investment policies. Since it was not possible to include all banks in the study, 15 open banks were chosen to represent the surviving banks, and 13 closed banks were chosen from the receiverships. The banks were selected with reference to geographical location, types of agriculture, financial condition, and operating policy, the plan being to have each group of banks represent a wide variety of conditions and policies."

Data were obtained from all available sources, including banks, supervisory authorities, receivers, and private individuals having knowledge of banks.

The banking difficulties brought on by the drought of 1930 and the depression are described. The reserve policies, loans, investments, earnings, expenses, profits, conditions of the banks, and the effects of the depression, etc., for the closed and surviving banks are analyzed, discussed, and compared.

The protective measures suggested are (1) that banks be required to hold liquid assets equal to the total of their bills payable and rediscounts and at least 60 percent of their deposits, and (2) that the terms on which time and savings deposits are accepted be altered. As to liquid assets as used in the suggestions, the authors state: "The term 'liquid assets', it will be observed, is here given a somewhat different meaning from that common in banking parlance. Cash, funds carried at approved reserve depositories, short-term commercial paper, acceptances, loans on adjusted service certificates, well-margined brokers' loans in moderate amount, and United States securities are considered liquid assets as is usually the case. Securities other than direct obligations of the United States, however, are not considered liquid, regardless of their rating,

price quotation, or seeming marketability, unless they are bonds of the highest standing maturing within one or two years. Recent experience shows that little confidence can be placed in the liquidity of securities in times of widespread depression, when liquidity is most needed by the banks. On the other hand, conservatively made loans for producing crops or for conducting current business operations, and loans for other purposes also if they appear easily collectible from the borrowers' annual income, are included among the liquid assets. Such loans had an excellent record of collections during the depression, and they can be rediscounted or used as collateral for borrowing at other banks in case funds are needed before they can be collected." The suggestions as to time and savings deposits are: (1) The minimum periods should be 1 yr. for time certificates and 6 mo. for savings accounts; (2) as a customary practice such deposits should not be paid before maturity; (3) the use of certificates of deposit with maturities of 2 or 3 yr. should be developed by offering preferential rates; and (4) a special group of assets should be segregated for the protection of time and savings deposits.

Appendixes set forth the methods used in the study in classifying loans of banks according to date of origin and purpose, and in computing the volume of liquid loans held by the banks.

The reorganization of county government in Ohio (*[Columbus]: State, 1934, pp. 190, figs. 8*).—This is the report of the commission appointed by the Governor of Ohio December 14, 1933, "to study problems involved in the reorganization of county government and to draft measures necessary for carrying out the purposes of the amendment to Article X of the Constitution of the State of Ohio, adopted November 7, 1933." The nature of Ohio counties, the present system of county government in Ohio, and different systems of county government are described. Chapters deal with the present organization and functions of the county commissioners; financial administration; purchasing; personnel administration; law enforcement; public welfare; public health; public works; recording and court service; and planning, parks, and libraries, describing the present systems, methods, etc., and making recommendations for reorganization.

Findings of the [South Africa] Cooperation Commission (*Farming in So. Africa, 9 (1934), Nos. 99, pp. 221, 222; 100, pp. 267, 268, 278; 101, pp. 320–322; 102, pp. 345, 346; 103, p. 409; 104, pp. 446, 447*).—The findings of the commission are set forth and discussed. The several articles pertain to (1) principles of cooperation, its development in South Africa, compulsory cooperation, and sales through one channel under boards of control; (2) the views of the commission regarding maize, wheat, dairy products, and fruit; (3) wine, tobacco, wool, and mohair; (4) meat, eggs, lucerne, chicory, peanuts, and cotton; (5) financing of associations; and (6) agricultural credit.

RURAL SOCIOLOGY

Population trends in Oklahoma, O. D. DUNCAN (*Oklahoma Sta. Bul. 224 (1935), pp. 34, figs. 9*).—It is the purpose of the present paper to study the changes in the population of Oklahoma that have taken place from 1890 to 1934 with reference to (1) geographic concentration and dispersion, (2) interstate migration, (3) quantitative growth of farm population, (4) age distribution, (5) sex composition, (6) marital condition, (7) racial and national origin, (8) occupational description, and (9) educational advancement.

Thus far the State of Oklahoma has been primarily an area of absorption. The population is 98.6 percent American and 87.5 percent native white. It is

composed of three distinct racial elements socially impervious to each other, but there has been constant biological mixing. The negro is culturally allied with the white race, having practically the same type of religion, education, occupation, and politics. In terms of sociability and intermarriage there is a coalescence between the whites and the Indian, but their underlying elements in cultural and psychological heritages are far removed from each other.

The population has shifted greatly toward the cities since 1890. Since 1910 the growth of population has been mostly urban, and in absolute numbers the farm population has remained almost constant.

Like most new agricultural areas, Oklahoma was settled by a population composed predominantly of males and comparatively young people. In recent years there has been a tendency toward balancing the age and sex ratios. Still, the proportion of marriageable males who have never married is about 1.5 times as great as that of marriageable women.

Since 1890 there has been a relative decline in the significance of agriculture and an increase in the relative importance of nonagricultural occupations as means of employment. Business, professions, and extractive industries have emerged in large proportions. Education has advanced with greater rapidity in the lower than in the upper cultural strata of population.

The tide of immigration has been checked and an exodus from the State is proceeding rapidly. Technological changes have reduced employment but little, but economic conditions have been out of balance for a long time. The State has depended too much upon booms and rushes to give impetus to industry. In the beginning the State overbuilt; villages were expected to become cities and cities metropolises. The results of exaggerated optimism are beginning to be felt while the State is endeavoring to digest and assimilate its intake of population during the past four decades and forging these factors into a more stable civilization.

How farm families meet the emergency, E. L. Kirkpatrick, R. Tough, and M. L. Cowles (*Wisconsin Sta. Res. Bul. 126 (1935), pp. 40, figs. 4*).—This is an analysis of the changed position of the farmer during 4 yr. of depression (1929–33). Subjects examined are changes in standards of living, self-sufficiency, the extent of curtailments of returns from farming, trends in participation in local organization activities, and the bearing of "hard times" on agencies and institutions in a typical rural community. Over 300 families in Green, Portage, and Sawyer Counties are included, continuing earlier work (E. S. R., 69, p. 613).

The study indicates that all the families have had to retrench in home and community standards of living. It suggests that there is a minimum standard of living for agriculture below which families cannot go without involving the typical rural community in too great risks for public welfare. In addition to the material necessities, any satisfactory living must have a nonmaterial emphasis dealing with family and larger group relations. Even minimum standards of living must be filled with definite objectives or ideals to strive for, ability to manage resources and spend incomes, inclination toward common interests, and participation in neighborhood and community affairs, for an economic and social life that is stable and satisfying. Lacking these attributes in their standards of living, farm families readily become marginal with respect to economic and social welfare. The data indicate that there are accepted optimum standards of living which are being tenaciously held by many farm families.

Family living varied by communities or by locality groups, as well as for families within these groups. Danger comes when any particular standard is dropped too drastically.

The social effects of retrenchments in support of schools, local government, and churches seem to have been felt with varying degrees of intensity; least severely in Sawyer County, where land clearing and home building still absorb the major energies of the people; most severely in Portage County, where the families have passed the land clearing and, to some extent, the home building stage, and yet have not attained the stability characteristic of Green County in their standards of living.

The study further indicates that many farm families are arriving at the point of needing relief to supplement their living and maintain public agencies and social facilities.

[Reports of Committee on International Relations of the American Country Life Association] (*Rural Amer., 13 (1935), No. 3, pp. 32*).—Included are the following reports: European Organizations for the Improvement of Country Life, by A. Hobson (pp. 3–12); Recent Rural Life Developments in China, by J. H. Reisner (pp. 12–18); Village Welfare in India—A Preliminary Report, by J. L. Hypes (pp. 18–27); and Homemaking and Community Activities of Rural Women, by G. E. Frysinger (pp. 27–29).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Vocational education and changing conditions (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 174 (1934), pp. V+112*).—This report, prepared by C. A. Prosser, is based upon the findings of a staff research committee of the Federal Board for Vocational Education in a study of the changing economic and social conditions and their effect upon vocational education. The seven chapters cover the economic changes affecting (1) the American worker and (2) all occupations; the difficulties and needs of workers in all occupations; the special difficulties and needs of wage earners, farmers, and homemakers; and the significant social trends affecting the workers.

Methods of teaching and organizing farm shop work in vocational agriculture departments in Missouri (*Missouri State Dept. Ed. Bul. 24 (1934), pp. 68, figs. 11*).—"The purpose of this publication is to bring together the best ideas on methods and practices in farm shop work in vocational agriculture classes in Missouri at this time." Included are sections, as follows: The Teaching and Organizing of Farm Shop Work, by J. T. Gibbs (pp. 11–31), setting forth the objectives of farm shop work and discussing the time to be allotted, method of procedure, records, job operations to be mastered, farm shop tools and equipment, etc.; Making Farm Shop Work Interesting and Attractive, by W. G. Wade (pp. 32–37); Outline for Course in Advanced Farm Mechanics in Vocational Agriculture Departments in Missouri, by J. L. Campbell (pp. 38–49), setting forth the objects and outlining a 1-unit course for students who have had 2 yr. of shop work; and Possibilities for Improving the Farm Shop Program, by M. M. Jones (pp. 51–61).

Nebraska: Its geography and agriculture, H. E. BRADFORD and G. A. SPIDEL (*New York: Macmillan Co., 1931, pp. IX+355, pl. 1, figs. 131, map 1*).—This is a textbook for use in the upper grades of rural and city schools.

Bibliography of studies of the home economics curriculum, 1926–1934 (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 179 (1934), pp. VI+70*).—This annotated bibliography, prepared by a committee of the home economics section of the Association of Land-Grant Colleges and Universities, was compiled by surveying articles in magazines and year books, January 1926 to May 1934; by consulting lists of titles of home economics education theses issued by the Office of Education, Department of the Interior; and by obtaining from colleges and

universities information as to studies in their institutions. It is divided into five sections—adult education, college, elementary school, secondary school, and miscellaneous. Author and subject indexes are included.

FOODS—HUMAN NUTRITION

Index to the literature of food investigation, compiled by A. E. Glennie (*[Gt. Brit.] Dept. Sci. and Indus. Res., Index Lit. Food Invest., 6 (1934), No. 1, pp. V+309*).—This issue of the series of annotated references noted occasionally (E. S. R., 69, p. 890) contains in addition to the customary references a brief review of developments during 1932–33 in the following topics: Gas storage of animal products, rancidity, marine animal oils, milk and milk products, eggs, freezing of animal and vegetable tissues, fruit juices, and storage and transport of fruit.

Nutrition laboratory, F. G. Benedict (*Carnegie Inst. Wash. Yearbook, 33 (1933–34), pp. 159–169*).—This annual report (E. S. R., 71, p. 556) contains, in addition to the usual brief outlines of investigations in progress and summaries of papers published during the year, a brief introductory section outlining the problems and factors involved in the study of the purely physiological processes incidental to the production and loss of body heat.

Continuation and extension of work on vegetable proteins, L. B. Mendel and H. B. Vickery (*Carnegie Inst. Wash. Yearbook, 33 (1933–34), pp. 289–295*).—This portion of this annual report (E. S. R., 71, p. 420) includes summaries of progress in investigations on the role of inorganic salts in the diet, on the nature of the different vitamin components in products containing the so-called vitamin B complex, and on reproduction in the albino rat (by A. H. Smith and W. E. Anderson).

Variability in experimental baking using hand and machine manipulation, J. G. Malloch and J. W. Hopkins (*Cereal Chem., 12 (1935), No. 1, pp. 57–61, figs. 2*).—A description, with photograph, is given of machines which have been designed for punching and molding doughs from 100-g samples of flour, and a comparison is reported of the variability in loaf volume of hand- and machine-manipulated loaves from five different flours, each baked once a week for 5 weeks.

Within each series the variability was definitely lower when the doughs were punched and molded by machine than by hand.

Notes on interpretation of standard baking test, R. T. Bohn (*Cereal Chem., 12 (1935), No. 1, pp. 61–68*).—This subcommittee report of the 1933–34 A. A. C. C. committee on the standardization of laboratory baking discusses methods of reporting results in the standard baking test (E. S. R., 59, p. 591) and points to be considered in interpreting the findings in absorption, loaf volume, loaf type and outside appearance, crust color, grain and texture, crumb color, and reactions to mixing and to bromate.

Observations on grain and texture, G. Moen (*Cereal Chem., 12 (1935), No. 1, pp. 78–83, figs. 5*).—Attention is called to the fact that significant differences in the crumb structure of breads made from different flours by the A. A. C. C. standard method often disappear when the breads are baked by commercial methods, and that consequently many flours when tested by the standard method are penalized although they give very good results in commercial practice. Photographs are given in illustration of the differences obtained.

Vegetables: Preparation and place in the diet, L. Ascham (*Georgia Sta. Bul. 188 (1935), pp. 22*).—This publication includes a discussion of the physiological functions of vitamins and minerals, the distribution of these foodstuffs

in vegetables, general principles in cooking vegetables, and suggestions with recipes for ways of using vegetables.

Further studies on frozen vegetables, R. P. STRAKA and L. H. JAMES (*Jour. Bact., 29 (1935), No. 3, pp. 313–322*).—Earlier experiments (E. S. R., 70, p. 127) had shown that botulinus toxin may develop in defrosted peas within 3½ days at room temperature.

Further studies, including examination of 198 additional samples defrosted and held at 42°, 50°, 60°, and 80° F. for from 2 to 7 days, were made. Ten of these contained botulinus toxin, 1 (uninoculated) having been held at 50° for 7 days, 6 (receiving a heavy inoculation) having been held at 80° for 2 days, and 3 (heavy inoculation) held at 50° for 7 days.

The remaining 188 contained no toxins, although some were badly fermented. It is concluded that when peas preserved by freezing are properly handled there is no danger of botulism. They should not be held at room temperature after defrosting, and left-over portions should be well refrigerated and thoroughly cooked before consumption.—(*Courtesy Biol. Abs.*)

Fruits in the diet, E. N. TODHUNTER (*Wash. State Hort. Assoc. Proc., 30 (1934), pp. 120–123*).—A brief discussion of the contribution of fruit to the diet with respect to mineral and vitamin values, color, flavor, variety, and laxative properties.

Factors affecting the quality of preserves made from Kieffer pears, H. H. MOON and C. W. CULPEPPER (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1934), No. 1, pp. 12–16, 20, 25, fig. 1*).—The authors have previously shown that considerably better quality is developed, both in fresh fruit and the canned product, when the Kieffer pear is stored at 60° to 65° F. than when stored at either higher or lower temperatures. This is shown in the present work to hold for Kieffer pears made into preserves. A better product is obtained from fruit held at 60° for 16 days than from that stored for shorter periods at this temperature or that freshly picked. In preserves made from equal weights of fruit and sugar, boiled to various temperature end points, the lot concentrated to an end point of 226.4° (108° C.) was most desirable. In lots made from varying proportions of fruit and sugar, that containing 54.2 percent of fruit was considered best, factors included in the decision being color, consistency, texture, and degree of disintegration of fruit, flavor, and yield of finished product. The flavor of the finished product did not increase in intensity in proportion to the increase in amount of fruit in the mixture.

A consistometer or penetrometer test for measuring the consistency of the product was employed with satisfactory results. The apparatus, a modification of that employed for consistency tests of lubricating greases and petrolatum, is described, and its possibilities for use with preserves and similar products discussed.—(*Courtesy Biol. Abs.*)

Anaphylactogenic properties of milk: Immunochemistry of the purified proteins and antigenic changes resulting from heat and acidification, B. RATNER and H. L. GRUEHL (*Amer. Jour. Diseases Children, 49 (1935), No. 2, pp. 287–306*).—Studies on the immunochemistry of the purified proteins of milk and of evaporated, acidified, and dried milk and on the anaphylactogenic properties of the various milk preparations, as tested on guinea pigs, are reported, with the conclusion that evaporated milk is the modification of greatest value for the person who is sensitive to milk. In the guinea pig feeding tests, in which from 50 to 85 animals were used for each preparation, the percentages of animals which were sensitized by the various milk preparations were raw skimmed milk 52 percent, Smaco 303 56, dried milk 52, boiled milk 27, and evaporated milk 25 percent.

Anaphylactogenic properties of malted sugars and corn syrup, B. RATNER and H. L. GRUEHL (*Amer. Jour. Diseases Children, 49 (1935), No. 2, pp. 307–317, fig. 1*).—By means of the anaphylaxis method with guinea pigs, the authors have demonstrated that barley malt and malt extracts are highly anaphylactogenic, that dextrimaltose irrespective of the type of starch used and method of manufacture, and corn sirup, both the ordinary commercial product and the malted sirup used in the preparation of certain kinds of dextrimaltose, are nonanaphylactogenic. The antigenic properties of barley malt, malt extract, and malt sugar were further shown to be related to the hordein of the barley protein. The addition of wheat germ or dried milk to nonanaphylactogenic preparations of dextrimaltose rendered them anaphylactogenic.

The authors conclude that allergy to carbohydrate foods cannot be attributed to the carbohydrates per se, but must be due to the protein constituents which are added to certain carbohydrate food preparations. Attention is called to the probability that those who cannot tolerate honey are sensitive to the specific protein constituents of the source of the nectar, such as buckwheat. In further illustration, it is noted that a number of patients sensitive to wheat have shown sensitivity to preparations of dextrimaltose containing vitamin B obtained from wheat germ. "It becomes obvious, therefore, that in the treatment of a patient who is hypersensitive to food the elimination of offending factors may be more complicated than is apparent, when one considers that a protein may insidiously enter the diet as a constituent of a carbohydrate food."

Iodine content of American cod liver oil, A. D. HOLMES and R. E. REMINGTON (*Amer. Jour. Diseases Children, 49 (1935), No. 1, pp. 94–100*).—Data are reported on the iodine content of 20 representative samples of crude medicinal cod-liver oil from the principal producing areas of the North Atlantic coast.

The lowest values obtained were for oils produced in the vicinity of Maine, 3,590 parts per billion (one sample), Massachusetts 4,930 (average of three samples), and George's and Brown's Banks, 5,340 (average of four samples) parts per billion. The other values were Newfoundland 8,360 (four samples), Gaspe Peninsula, Quebec, 11,250 (five samples), and Nova Scotia 13,260 parts per billion (three samples). In discussing the low values of the New England oils, it is pointed out that the oils in this section are produced during the winter and those in the more northern areas during the summer, and that it is possible that the difference may be one of season rather than of locality inasmuch as the cod is a migratory fish.

It is estimated that 10 cc of cod-liver oil, the amount recommended in the U. S. *Pharmacopoeia* for daily consumption, would supply 75γ of iodine, an amount well within the estimated daily human requirement of between 50γ and 100γ.

"Digestibility" of common foodstuffs as determined by radiography, W. C. D. MAILE and K. J. L. SCOTT (*Lancet [London], 1935, I, No. 1, pp. 21–23*).—The method followed in this investigation of the digestion time of various foods in the stomach was to make frequent radiographic observations following the ingestion of various test meals mixed with an ounce of barium. The meals were generally taken in the morning and the stomach was screened at intervals until emptying was complete. Tabulated data are given on the results obtained on normal adult subjects with single foods, mixed meals of various kinds, and an ordinary diet throughout the day.

The average emptying times for single foods ranged from 45 min. for 1 pt. of water to 6½ hr. for 1 pt. of raw rich milk. One pt. of boiled rich milk required 5 hr. and 4 oz. of emulsified butter 6 hr. The emptying time for raw eggs (2) was 3¼ hr., lightly boiled 2½ hr., and hard boiled 4½ hr. A

mixture of 2 raw eggs and milk required 4¼ hr. Among other values were 4 oz. of raw banana 4¼ hr., 4 oz. white bread 3¾ hr., 5 oz. boiled potato 4 hr., 4 oz. of boiled beef 4 hr., and 4 oz. of vegetables 2½ hr.

The emptying time for mixed meals of various kinds ranged from 4 to 6 hr. The meals for one day included breakfast at about 9 a. m., lunch at 1:30 p. m., tea at 4:35, dinner at 7:30, and supper (tea and a small piece of short bread) at about 10 p. m. The fact that the stomach was not nearly empty at tea time led the authors to make the comment that "on the grounds of suitable feeding, it would be better to leave out tea and take dinner at 6 or 6:30 p. m. The stomach would then have a little rest before both lunch and dinner, and would be ready to deal with the evening meal, which in the ordinary way would be disposed of by 10:30 to 11 p. m."

There appeared to be no relation between the sensation of hunger and vigorous peristalsis.

The digestibility of foods (*Lancet* [*London*], *1935, I, No. 1, p. 35*).—Editorial discussion of the above-noted paper and one by Rehfuss (E. S. R., 73, p. 126).

Nutrition and diet therapy, F. T. Proudfit (*New York: Macmillan Co., 1934, 6. ed., rev., pp. VIII+834, figs. 42*).—In this revision of the volume noted previously (E. S. R., 65, p. 890), "the author has endeavored to incorporate the newest methods of teaching the fundamental principles of nutrition and diet therapy, as indorsed by the American Dietetic Association and American League of Nursing Education. The text follows the approved outline of courses in Dietetics for Nurses published by the American Dietetic Association (Revised Edition, 1933)."

Relation of food to length of life, H. C. Sherman (*Carnegie Inst. Wash. Yearbook, 33 (1933–34), pp. 295–297*).—In this progress report (E. S. R., 71, p. 561), the author discusses points of similarity and differences between the phase of his own investigation which compares observations upon growth with those upon length of life and the experiments of McCay (E. S. R., 69, p. 752) dealing with forced or maximal growth and length of life.

A comparison of the normal blood picture of rats of two different colonies reared upon different stock rations, D. L. Drabkin and T. Fitz-Hugh, Jr. (*Amer. Jour. Physiol., 108 (1934), No. 1, pp. 61–65*).—The two colonies studied were (1) stock rats from the authors' colony reared on a modified Steenbock stock diet, and (2) Wistar Institute rats reared on mixed natural foodstuffs.

During the first 30 days of life the blood samples of the animals from the two colonies showed similar transitional changes. The peak of anemia occurred at 23 days in each group, although the animals from the authors' laboratory were slightly more anemic than the Wistar animals. The reticulocyte count was considerably higher in the latter animals. At the weaning period a sudden increase in hemoglobin values to adult levels occurred in both groups.

The adult rats in the Wistar colony had definitely lower reticulocyte, higher hemoglobin, and somewhat higher red blood cell values than the animals of corresponding age in the authors' colony.

"These differences in hemoglobin level and reticulocytosis may be related to the markedly different nutritional backgrounds of the animals. Such differences in the animals used by various investigators of the problem of nutritional anemia may be among the factors responsible for the discrepant results in the literature. From the standpoint of other nutritional investigations, besides those of anemia, it is considered worth while to call attention to the existence of physiological differences in animals so highly inbred as the albino rat."

A simple method of preventing the high mortality of young rats during the nursing period, M. C. Smith and R. M. Leverton (*Jour. Home Econ., 26*

(*1934*), *No. 10*, *pp. 628, 629*).—In the authors' experience high mortality of young rats during the nursing period has been prevented by "isolation and lack of handling of the nursing females and their young; maintenance of a uniformly high temperature; and the use of large quantities of bedding material, which not only serves to prevent draft but perhaps encourages the nesting instinct."

An experiment in first-class protein, H. C. C. MANN (*Lancet* [*London*], *1935*, *I*, *No. 3*, *pp. 145–147*).—This paper, which contains an introduction by F. G. Hopkins, describes an investigation in which the author attempted, by observations of subjective symptoms only, to determine the effects of altering the quality of the protein in a standard diet consumed over long periods of time. During the investigation regular scheduled exercise consisting of walking 15 miles a week was followed. The dietary regime was as follows: Period 1, a basic diet previously found satisfactory was taken for 4 mo.; period 2, the basic diet with half of the milk, 10 oz., deducted for 6 weeks; period 3, the basic diet for 3 mo.; period 4, the basic diet with removal of the entire amount of meat (which furnished the same amount of protein as the milk removed in period 2) and of sufficient cake to make up the same number of calories, for several weeks; period 6, the same diet as in period 2 with the addition of 10 oz. of water every night for 3 mo.; and period 7, the basic diet.

In period 2 there was loss in weight and a general deterioration in physical condition. The symptoms of exhaustion disappeared rapidly in period 3 and did not reappear in period 4. The same symptoms of fatigue and loss of weight occurred in period 6 when hot water was added to the reduced diet in order to obviate possible dehydration from reduction in the milk.

From these subjective symptoms the author concludes that "the protein of milk appears to be of more value for purposes of nutrition than the protein of meat."

The utilization of energy-producing nutriment and protein in white and yellow corn and in diets deficient in vitamins A, D, and G, W. M. BRAMAN, A. BLACK, O. J. KAHLENBERG, L. VORIS, R. W. SWIFT, and E. B. FORBES (*Jour. Agr. Res.* [*U S*], *50* (*1935*), *No. 1*, *pp. 1–37*, *figs. 5*).—By use of the paired feeding method, with body and excreta analyses, comparisons were made at the Pennsylvania Experiment Station of the utilization of the protein and energy of equicaloric quantities of rations which were alike in composition except for single factors. White corn and yellow corn were compared; also rations deficient in vitamin A, or D, or G were compared with others containing these nutrients.

The results of the corn experiment show that the yellow corn ration produced a favorable effect on appetite and a superior gain in live weight, while the white corn ration excelled in digestibility of food energy and in supporting body gain of energy.

In the vitamin A experiment, in which the deficiency was partial rather than complete, no significant differences were found as to digestibility, heat production, or gain of energy. The vitamin A-supplemented diet proved superior with respect to palatability and gain in live weight and protein.

A diet deficient in vitamin D compared with the same diet plus vitamin D caused a superior gain of body protein, whereas the more nearly complete diet proved superior in body gain of fat and of energy. The heat production was greater with the vitamin D-deficient diet. There was no significant difference between the two diets with respect to digestibility of protein or energy, gain in live weight, energy of the excreta, or the ratio of carbon to nitrogen in the urine.

A deficiency of vitamin G resulted in depressed appetite, and diminished growth, synthesis of protein and fat, and storage of energy. There was no

appreciable effect on digestibility of protein or of energy, or on heat production. The ratio of carbon to nitrogen in the urine was increased as a result of vitamin G deficiency.

Studies on dietary requirements for lactation.—II, Presence of lactation-promoting substance in liver extract, W. NAKAHARA and F. INUKAI (*Bul. Agr. Chem. Soc. Japan, 10 (1934), No. 7–9, pp. 129–135, figs. 5*).—This continuation of the series (E. S. R., 71, p. 420) has been noted essentially from another source (E. S. R., 72, p. 284).

Infant feeding and nutrition: A decade of progress, S. FRIEDMAN (*Amer. Jour. Diseases Children, 49 (1935), Nos. 1, pp. 153–190; 2, pp. 460–473*).—This critical review of the developments of the past decade in the science of infant nutrition is presented under the headings breast milk and feeding of the newborn, artificial feeding, mineral metabolism, and vitamins. The topics considered under artificial feeding include acidified milk; protein milk; evaporated, dried, and condensed milk; concentrated feedings; carbohydrates; milkless diets or vegetable milks; and a special group, including the use of gelatin, certified milk v. pasteurized milk, and the self-selection of diets by infants. About 200 references to the literature are given as footnotes.

Body build in infants.—IV, The influence of retarded growth, H. and R. M. BAKWIN and L. MILGRAM (*Amer. Jour. Diseases Children, 48 (1934), No. 5, pp. 1030–1040, figs. 6*).—The conclusion drawn in a previous study that infants from an unfavorable social environment are not only shorter and weigh less than infants from a more favorable environment, but have significantly smaller lateral dimensions, has been confirmed by a continuation of measurements on the two groups and an enlargement of the groups. Observations have also been made on a third group from the same social environment as the poorer group, but receiving the customary benefits of a health clinic. The increases in height and weight of the infants in this group approached those of the group from the more favorable environment, and this was also true of the lateral dimensions. These findings are thought to demonstrate that it is possible through care, particularly with respect to the diet, to improve growth in height and weight and to alter favorably body proportions without changing the environment.

Inasmuch as the delay in growth of the retarded group occurred between the fourth and twelfth weeks, it is thought that the main defect in the diet was an inadequacy of energy-yielding substances rather than accessory foods.

Basal metabolism of American-born Chinese girls and of American girls of same age, C. C. WANG (*Amer. Jour. Diseases Children, 48 (1934), No. 5, pp. 1041–1049*).—Attention is called to the contradictory conclusions of Benedict and Meyer (E. S. R., 70, p. 562) and Wang and Hawks (E. S. R., 68, p. 410) concerning the basal metabolism of American-born Chinese girls with relation to American girls of the same age. The data for the two studies are compared, and new data are presented on the basal metabolism of 14 American girls from 12 to 20 yr. of age in Cincinnati. In addition the new data are compared with data for American girls reported by Tilt (E. S. R., 63, p. 593) and by MacLeod (E. S. R., 55, p. 896). In all cases the percentages of deviation from various standards have been calculated.

The comparisons indicate that the basal metabolism values for American girls of different age groups, as well as from different sections of the country, show a greater diversity than the values for girls of the two races. The author expresses the opinion that "judging from the foregoing comparisons, it is difficult to conclude that orientals have a lower basal metabolism than occidentals. The studies conducted on the two groups of American-born Chinese

subjects have certainly failed to show any difference between their basal metabolism and that of Americans of the same age range."

Sane reducing diets and how to plan them, H. T. BARTO (*Illinois Sta. Circ. 433 (1935), pp. 12*).—Included in this nontechnical publication are reducing menus for one week which were used in studies made during 1929 to 1932 on the effect of reducing diets on overweight women students at the University of Illinois. The plan followed is described, and some of the weight losses and favorable subjective symptoms are noted. The circular also contains a list of foods recommended in reducing menus with the common measure or serving and its approximate number of calories.

List of references on dinitrophenol weight reduction diet, 1885–1934, compiled by E. M. SALMONSEN (*John Crerar Libr., Ref. List 29 (1934), pp. [1]+11*).—The magnitude of recent literature on the use of dinitrophenol in weight reduction diets is shown by the fact that of the list of 125 references arranged chronologically from 1934 to 1885, 63 of the references are for 1934.

Further studies on the availability of iron in biological materials, W. C. SHERMAN, C. A. ELVEHJEM, and E. B. HART (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 383–394, figs. 3*).—In an extension of the authors' studies on the availability of iron in various food materials (E. S. R., 71, p. 130), it was first noted that with certain animal tissues only a very small portion of the iron present reacted with the bipyridine reagent when suspended in the sodium acetate-acetic acid buffer at pH 5, but that on increasing the acidity of the suspension to overcome the strong buffering system of the tissues much higher values were obtained. A 10 percent concentration of acetic acid was selected as the most satisfactory acidity for the determination.

Of the materials tested by the bipyridine method with 10 percent acetic acid, liver and heart muscle of beef and pork and soybeans were the only ones to show an availability of over 60 percent. Beef skeletal muscle had an availability of 50 percent and oysters, spinach, alfalfa, and blood of 25 percent or less.

In the animal feeding tests the materials were fed at levels furnishing 0.3 mg of total iron and in some cases also at a level of 0.3 mg of available iron. Copper sulfate in an amount to furnish 0.5 mg of copper daily was always fed. Another precaution taken in experiments with iron salts was to furnish manganese (0.04 mg of Mn as $MnCl_2.4H_2O$ daily), so that growth might be comparable with that obtained on natural food materials.

When pork or beef liver or heart muscle was fed at a level to insure a daily intake of 0.3 mg total iron, the hemoglobin response was nearly as rapid and complete as when the iron was fed as $FeCO_3$. Beef skeletal muscle produced slow and incomplete regeneration at a total iron level of 0.3 mg and better but still incomplete regeneration at 0.5 mg. Spinach did not bring about complete regeneration at a level of 0.3 mg of total iron, but did at a level of 0.3 mg available iron. Alfalfa was not consumed in amounts large enough to bring about complete regeneration, but soybeans fed raw brought about nearly complete regeneration at a level of 0.3 mg of total iron. Roasted soybeans were slightly inferior to raw. Complete regeneration was secured with soybeans at a level of 0.3 mg available iron. Oysters and blood produced only slight regeneration. Unsuccessful attempts were made to determine the availability of iron in dried apricots and raisins, as the pigment interfered with the red iron-pyridine color, and the animals disliked the flavor.

The authors conclude that the correlation between available iron as determined by animal feeding and inorganic iron as determined by the bipyridine method has been established for a sufficient number of foods to warrant

the statement that the available iron in practically any food can be estimated by the bipyridine method provided the pH is properly adjusted. In discussing the discrepancy between their results with the animal feeding method and those reported by other workers, the necessity is emphasized of depleting the animals completely of their iron reserves before beginning the test and of supplementing the foods with adequate copper when the availability of iron is being studied and adequate iron when the availability of copper is being studied.

Studies of phosphorus of blood.—III, The phosphorus partition in whole blood and in serum and the serum calcium and plasma phosphatase during healing of late rickets, G. STEARNS and E. WARWEG (*Amer. Jour. Diseases Children, 49 (1935), No. 1, pp. 79–90, figs. 3*).—This continuation of the series of papers, the first of which has been noted (E. S. R., 70, p. 873), constitutes the complete report of an investigation noted previously from a preliminary report (E. S. R., 71, p. 573).

Zinc in the nutrition of the rat, W. R. TODD. C. A. ELVEHJEM, and E. B. HART (*Amer. Jour. Physiol., 107 (1934), No. 1, pp. 146–156, figs. 2*).—Young rats were placed at weaning in monel metal cages and fed a highly purified diet containing only 1.6 mg of zinc per kilogram body weight, but amply provided with all the known vitamins and with essential mineral elements other than zinc. The diet was also supplemented by small quantities of milk (2 cc per animal per day).

When no additional zinc was fed, growth was markedly inferior and there was a loss of fur about the neck and shoulders. When zinc oxide or zinc chloride was added to the extent of 5 mg of zinc per 100 g of the diet, the rate of growth was accelerated and the fur development normal.

Physiological properties of the vitamins, R. R. WILLIAMS and W. H. EDDY (*Carnegie Inst. Wash. Yearbook, 33 (1933–34), pp. 297–301*).—In this progress report data are given on the elementary composition of the crystalline vitamin B_1 prepared by the method described previously (E. S. R., 71, p. 298), leading to the conclusion that $C_{12}H_{18}N_4OS.2HCl$ is the correct formula for the dry hydrochloride. The chemical properties and optimal dosage (for rats) are discussed, and a summary by M. C. Vorhaus is given of preliminary results obtained by different collaborators in the treatment of various disorders with the crystalline vitamin. Among the conditions for which favorable results are reported in the few cases thus far treated are beriberi, stomatitis with colitis, deficiency edema with colitis, metabolic polyneuritis of pregnancy, and gastro-intestinal atony.

Effect of fertilization, freezing, cooking, and canning on the vitamin C and A content of asparagus, C. R. FELLERS, R. E. YOUNG, P. D. ISHAM, and J. A. CLAGUE (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 145–151, figs. 6*).—Data reported from the Massachusetts Experiment Station indicate that the content of vitamins A and C in asparagus is not affected appreciably by variations in the amount of potash and nitrogen used in the fertilization of the soil, that freezing of asparagus does not cause a loss in its vitamin C content, and that cooking causes a loss of 70 percent and canning of about 75 percent of its vitamin C content. "Fresh or cooked green asparagus contains approximately 8 units of vitamin A per gram. Fresh asparagus contains 0.5 unit of vitamin C per gram, cooked approximately 0.12 unit, and canned 0.1 unit."

Vitamins C and A in maple products, C. R. FELLERS and G. G. SMITH (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 96, 97, figs. 2*).—In studies at the Massachusetts Experiment Station maple sap and sirup were found to con-

tain no measurable amounts of vitamin C and maple sugar only negligible amounts of vitamin A.

Influence of vitamins A and D on the humoral reactions in human tuberculosis [trans. title], J. Donato, R. Jaquot, and H. Penau (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 4, pp. 397–399*).—The blood sera of 40 patients with pulmonary tuberculosis were analyzed at frequent intervals over long periods of time during treatment by intramuscular injection of a mixture of carotene and vitamin D in oil. The tests included cholesterol, calcium, and serum flocculation. Tabulated data reported for 4 of the cases showed a general increase in the calcium and cholesterol of the blood and a lowering of the value for serum flocculation to normal. Phosphorus determinations made on the sera of 2 of the patients showed a similar increase in phosphorus. The hemoglobin of the blood also increased from 70 to 95 percent and the red blood cells from 3,600,000 to 5,000,000, and the patients gained in weight. The bacteria in the sputum decreased, and healing was shown on X-ray examination.

Vitamine therapy in intestinal tuberculosis, M. M. Steinbach and M. B. Rosenblatt (*Amer. Rev. Tuberc., 31 (1935), No. 1, pp. 35–43*).—The literature reporting clinical improvement in tuberculosis of the intestines through vitamin therapy is reviewed briefly, and a report is given of the experience of the authors in the use of cod-liver oil and tomato juice in such treatment in the Montefiore Hospital in New York City for about 2½ yr. The report is confined to observations on 16 patients. Four of these had shown symptoms suggesting advanced intestinal tuberculosis, but on autopsy no evidence was found of recent or healed intestinal ulcerations, and these subjects are not included in the group for which clinical and pathological findings are reported. All but 2 of the remaining 12 died at intervals of from 1 mo. to 2 yr. after vitamin therapy had been instituted. The post-mortem findings in the examination of the tuberculous intestines showed in all cases tuberculous ulcerations in either the ileum, cecum, or ascending colon, with an almost negligible degree of healing.

The authors conclude that vitamin therapy neither cures nor prevents intestinal tuberculosis.

Ulcerative colitis.—II, The factor of deficiency states, T. T. Mackie (*Jour. Amer. Med. Assoc., 104 (1935), No. 3, pp. 175–178*).—Evidence of nutritional deficiencies has been observed by the author, assisted by M. Henriques, in 62.6 percent of 75 cases of chronic ulcerative colitis. The phenomena described include abnormal conditions of the skin, lesions in the buccal and lingual mucosa, anemia, and disturbances in blood chemistry. The probable deficiencies involved and the causative factors are discussed, with the conclusion that inadequate supplies of vitamins A, B_1, B_2, and possibly D, together with lack of biologically complete protein and of electrolytes, contributed in varying degree to the clinical picture. The fact that the symptoms of deficiency disease appeared in spite of adequate diets is thought to indicate a fundamental disturbance of physiology secondary to the diseased colon as a probable cause.

In the author's opinion deficiency disease is not an occasional complication of chronic ulcerative colitis but an essential part of the underlying mechanism. "The progression that many of the patients have shown under prolonged observation suggests that the potentially severe and untreated or imperfectly treated case tends to pass through three stages. In the initial phase clinical evidence of deficiency disease is lacking. The second stage is characterized by the appearance of early signs of deficiency. In the third stage, which is relatively rare, deficiency disease is severe and tends to dominate the clinical picture."

Vitamin A content of certain green leaves: Dandelion, dock, and lamb's quarters, M. M. KRAMER and L. M. OBERHELMAN (*Jour. Home Econ., 26 (1934), No. 10, pp. 637, 638*).—Fresh raw dandelion greens are reported to have a vitamin A content of 200 Sherman units per gram, the leaves of the curled dock (*Rumex crispus*) about 200, and the leaves of lambsquarters more than 100 units per gram.

The vitamin A content of five varieties of sweetpotato, F. L. MACLEOD, M. R. ARMSTRONG, M. E. HEAP, and L. A. TOLBERT (*Jour. Agr. Res.* [*U. S.*], *50 (1935), No. 2, pp. 181–187, figs. 5*).—This investigation was undertaken at the Tennessee Experiment Station to determine the vitamin A value of different types of sweetpotato (*Ipomoea batatas*) commonly grown in Tennessee, including the highly pigmented Nancy Hall, Yellow Jersey, and Porto Rico varieties and the lighter colored Triumph and Southern Queen. The sweetpotatoes were grown on the university farm and were cured at 85° to 90° F. and stored at 50° to 60°. The Porto Rico and Yellow Jersey varieties were tested directly after harvesting and again 2 or more months later. The other types were tested only after they had been stored for some time. The samples were fed raw and were cut in such a way that the animals always obtained a representative cross-section. The Sherman-Burtis modification of the Sherman-Munsell method of determining vitamin A was followed.

The Porto Rico variety was found to contain about 20 units of vitamin A per gram directly after harvesting and about 65 units per gram after storage for 2 mo. or more. The Yellow Jersey contained less than 10 units per gram before and 40 units per gram after storage. The values of the other varieties after storage were Nancy Hall 30, Triumph 2, and Southern Queen 4 units per gram.

These values show not only that the more highly pigmented sweetpotatoes are richer in vitamin A than the lighter varieties, but also that the vitamin A content of the sweetpotato increases to a marked degree on storage. The increase is thought not to be due to changes in moisture content on storage. The possibility is suggested that "the carotene in the sweetpotato is not fully developed when the roots are first harvested, that the carotene has not yet developed into the precursor of vitamin A, or else that this precursor (the carotene responsible for the formation of vitamin A in vivo) is present in a form less available to the animal body when the sweetpotatoes are first harvested than after they have been stored for some time."

Vitamin A content of Early Richmond and Montmorency cherries, M. M. KRAMER and A. T. AGAN (*Jour. Home Econ., 26 (1934), No. 10, pp. 638, 639*).—Cherries of the Early Richmond and Montmorency varieties were found to be similar in vitamin A value, containing between 2 and 4 Sherman units per gram. The same varieties held in frozen storage contained between 4 and 6 units per gram.

Vitamin A and carotene.—XI, The distribution of vitamin A in the organs of the normal and hypervitaminotic rat, A. W. DAVIES and T. MOORE (*Biochem. Jour., 28 (1934), No. 1, pp. 288–295*).—In continuation of the series of papers noted previously (E. S. R., 71, p. 134), data are reported on a repetition of an earlier study by Moore (E. S. R., 66, p. 592) of the distribution of vitamin A in rats fed varying amounts of carotene as red palm oil, and an extension of the study to include rats which had received large amounts, both nontoxic and toxic, of a vitamin A concentrate. The alkaline digestion technic of Davies (E. S. R., 72, p. 584) was used in the colorimetric estimation of vitamin A.

In 5 rats which had been fed for several weeks a diet containing 15 percent of red palm oil, with the addition of carotene in some cases, the vitamin A

content of the liver ranged from 90 to 150 blue units per gram and of the kidneys from 1 to 10 units. In only 2 of the animals was there a positive reaction in the lungs and in only 1 out of 3 tested in the intraperitoneal fat.

In 3 rats fed large but not toxic doses of a vitamin A concentrate (3.5 mg or 3,000 blue units daily) for 38 days, the vitamin A content of the combined livers on autopsy was 40,000 blue units per gram. The kidneys contained 50 blue units, the intraperitoneal fat 80, the lungs 450, and the suprarenals 2,500 blue units per gram. In 4 adult rats given correspondingly large doses of vitamin A, but with the treatment discontinued for several weeks before killing, the concentration of vitamin A in the liver varied from 8,000 to 15,000, the kidneys from 2 to 10, the lungs from 25 to 150, and the suprarenals from 0 to 70 blue units per gram.

Two young rats given doses of from 12 to 14 mg per day of the vitamin A concentrate died after 12 and 33 days, respectively, with various pathological symptoms. The vitamin A values in the various organs were liver 15,000 and 60,000, kidneys 60 and 600, lungs 1,250 and 1,000, and suprarenals 0 and 50 blue units per gram, respectively. The heart and brain, which, in the animals receiving large but not toxic doses of vitamin A contained insignificant amounts of the vitamin, contained 100 and 25 and 15 and 15 units, respectively. These findings are thought to suggest that "death may occur while there is still room for a considerably greater accumulation of vitamin A in the liver, and that the production of hypervitaminosis does not depend on the absolute amount of vitamin A present in the organism but on the ingestion of the vitamin at a greater rate than that at which it can be stored by the liver or eliminated by the organism."

Two rats which were given about 8 mg of carotene daily grew rapidly and remained in good health. When killed after 34 days, the liver reserve was found to be only moderately high (1,250 blue units per gram per day), thus pointing to only about 1 percent absorption. Only traces of the vitamin were present in the lungs and kidneys and none in the other organs.

"The superior rate and efficiency of absorption of vitamin A suggest that in intensive vitamin A therapy preformed vitamin A should be more efficacious than carotene. At levels approaching the minimum dose, as previously shown, vitamin A and carotene appear to be equally efficiently utilized."

Hypervitaminosis A and the harmlessness of large doses of provitamin A (crystalline carotene) [trans. title], J. T. LEWIS and L. RETI (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 6, pp. 577–580*).—Evidence is given of the toxicity for rats of massive doses of the vitamin A concentrate Vogan and of the nontoxicity of correspondingly large doses of carotene. It is suggested that the toxic symptoms produced by the former are not a form of hypervitaminosis or a nonspecific harmful action of vitamin A, but are possibly due to another substance present in the nonsaponifiable fraction of cod-liver oil.

Water economy and vitamin A [trans. title], G. DOMINICI and G. OLIVA (*Deut. Med. Wchnschr., 60 (1934), No. 51, p. 1955*).—It is reported that the administration of a vitamin A concentrate Vogan in doses of 32,000 rat units daily increased to a marked extent the excretion of urine in patients with various liver diseases but not in normal subjects. This is thought to be due to a direct action of the vitamin on the liver, increasing its power of regulating water economy.

Avitaminosis A and the utilization of lipoids [trans. title], L. RANDOIN and R. NETTER (*Compt. Rend. Acad. Sci. [Paris], 198 (1934), No. 4, pp. 395–397, fig. 1*).—Negative results are reported for lard as a source of vitamin A for young rats and for the possible sparing action of lard for vitamin A with

or without the addition of irradiated ergosterol in amounts furnishing 4 international units of vitamin D per rat per day. The growth curves of the rats were practically identical in experiments in which lard was fed at levels of 12, 24, and 36 percent and peanut oil at a level of 12 percent in diets containing no other source of vitamin A.

It is concluded that variations in the proportion of fat and the presence of vitamin D have no sparing action for vitamin A.

Studies on the presence of vitamin A and the substance A′ in liver tissue [trans. title], A. CHEVALLIER and Y. CHORON (*Compt. Rend. Soc. Biol.* [*Paris*], *118* (*1935*), *No. 2, pp. 159–162, figs. 2*).—Solutions in hexane of a chloroform extract of minced liver tissues of rats and guinea pigs at various intervals after the ingestion of a green vegetable as a source of vitamin A were examined spectroscopically for evidence of the presence of vitamin A and the substance A′ (E. S. R., 72, p. 154).

The absorption curves for the extract of rat liver showed a gradual change from that of vitamin A to A′, while in the guinea pig the curves were almost identical for the samples examined at 3 and 36 hr. after feeding, both showing the practical absence of vitamin A and the substance A′.

The relation of vitamin A and its precursor to liver injury and to resistance against infections.—VII, Continuation of the investigation on hyperthyroidism [trans. title], E. SCHNEIDER and E. WIDMANN (*Klin. Wchnschr., 13* (*1934*), *No. 42, pp. 1497–1502*).—Using both rats and guinea pigs as experimental animals, the authors have determined the carotene, vitamin A, fat, and in some instances the glycogen content of the livers of normal rats and guinea pigs and others subjected to liver injury in varying degrees resulting from the injection of thyroid hormone. The carotene and vitamin A, the latter in the form of the concentrate Vogan, were administered orally and the thyroid hormone by intraperitoneal injection. In the state of complete exhaustion of the vitamin A reserves, carotene could no longer be transformed into vitamin A in the animal body, although vitamin A itself was well utilized. Liver injury caused by thyroid hormone injection resulted in a loss of vitamin A through increased metabolism rather than through a defect in utilization. The power of utilizing vitamin A under these conditions was 8 times as great as that of carotene. The vitamin A exchange was thought to be coupled with that of the glycogen of the liver.

Comparative experiments of long duration on fat-soluble vitamins [trans. title], L. RANDOIN and R. NETTER (*Bul. Soc. Chim. Biol., 16* (*1934*), *No. 4, pp. 595–608, figs. 5*).—In this investigation of the effect of various oils on reproduction in rats the following diet, a modification of that of Evans and Burr (E. S. R., 58, p. 595), was used: Purified casein 17.2, dry brewery yeast 4.3, lard filtered at 40° C. 21, cod-liver oil 1.9, wheat starch 51.8, and Osborne and Mendel salt mixture 3.8 percent, with filter paper and distilled water ad libitum.

On this diet young rats of both sexes with an initial weight of about 30 g grew well, but were invariably sterile. The addition to the diet of 2 drops of corn oil per rat per day restored fertility, but did not permit rearing of the young. Two drops of wheat oil daily did not prevent or cure sterility, but prolonged the survival period of young rats placed on the deficient diet when weighing from 70 to 100 g.

On a similar diet without cod-liver oil, 2 drops daily of wheat germ oil promoted growth at a more satisfactory rate than 30γ of carotene in experiments carried through several generations. This is thought to indicate that wheat germ oil contains a growth-promoting factor not identical with the known forms of vitamin A.

The action of vitamin A on serum cholesterol in man [trans. title], F. LASCH (*Klin. Wchnschr., 13 (1934), No. 43, pp. 1534–1536, figs. 4*).—Vitamin A in the form of the concentrate Vogan (Merck) was administered orally in milk to 7 subjects 3 times a day in doses amounting to 120,000 and 240,000 units. After from 5 to 10 days there was an increase in serum cholesterol, chiefly in the ester fraction. This is thought to indicate that the vitamin has a direct effect on the regulating action of the liver for cholesterol metabolism.

The effect of infra-red radiation on the growth of vitamin deficient rats, A. SZCZYGIEL (*Amer. Jour. Hyg., 21 (1935), No. 1, pp. 229–232, fig. 1*).—Infrared radiation of known energy content was found to have no growth-stimulating effect for rachitic rats on the McCollum rickets-producing diet 3143, but in three out of four experiments vitamin A-deficient rats receiving infrared radiation grew better and showed a slightly longer survival period than the controls. "However, the difference between the radiated and control groups was not striking enough to justify the conclusion that near infrared radiation has any specific stimulating effect on growth."

The effect of vitamin A on the common cold, G. S. SHIBLEY and T. D. SPIES (*Jour. Amer. Med. Assoc., 103 (1934), No. 26, pp. 2021–2026, figs. 2*).—The aim of the study reported was to determine whether or not the addition of substantial amounts of vitamin A to average and perhaps somewhat deficient diets would significantly influence the incidence, severity, and duration of colds. The subjects were first- and second-year students of medicine and of nursing, physicians, and nurses, totaling 241 at the beginning and 211 at the end of observations which covered more than a year, starting in January 1933. The subjects were divided into three groups, one of which received halibut liver oil in single weekly doses containing 200,000 international units of vitamin A and 4,000 international units of vitamin D. Another group received the viosterol equivalent of the haliver oil and a third plain corn oil. All of the materials were given in small amounts of tomato juice in order that the subjects might be ignorant of the group to which they had been assigned. Weekly reports of respiratory infections were kept on special forms.

The data as thus obtained show that the supplementary feeding of vitamin A in no way reduced the number or severity of the colds, but appeared to shorten by 2 or 3 days the average duration of colds occurring in the winter. "Whether this difference in winter as compared with spring, summer, and fall bears any relationship to the reduction of leafy vegetables in the diet in the winter months with consequent decrease of provitamin and whether, if confirmed, it represents a seasonal deficiency analogous to that associated with avitaminoses in general is a matter for speculation."

Fat metabolism in vitamin A deficiency: The blood-serum esterase, H. N. GREEN (*Biochem. Jour., 28 (1934), No. 1, pp. 16–24*).—Vitamin A deficiency in the rat was found to produce a large and progressive decrease in the esterase content of the blood serum. In infected rats on a complete diet there was also a considerable decrease, but in rats which had lost weight on account of underfeeding or a deficiency in vitamin B (complex) there was only a slight decrease. It is thought that further work may show that a decrease in the serum esterase content occurs in many conditions, including vitamin A deficiency, in which there is a profound metabolic disturbance in the body cells.

Fat metabolism in vitamin A deficiency: The utilisation of fat and the desaturation of fat in the liver, H. N. GREEN (*Biochem. Jour., 28 (1934), No. 1, pp. 25–30*).—This investigation included comparisons with young rats of the growth and survival periods on vitamin A-free diets high and low in fat, of the effect of vitamin A deficiency and of restriction of total food intake on the fat

content of the body, and of the effect of vitamin A deficiency, underfeeding, and artificial infection on the iodine values of the liver fatty acids.

In none of these comparisons was evidence obtained of a specific effect of vitamin A on fat metabolism. A diet rich in fat did not accelerate the utilization of vitamin A in the body. The diminution in total crude fat of the body was not significantly different in the vitamin A-deficient rat from that in the rat on a complete diet with the food intake restricted to that of the deficient animal. The rise in iodine value of the fatty acids of the liver occurring in the end stages of vitamin A deficiency was of a similar order to that observed where a similar loss of liver fat had been produced by a restriction of food intake or by infection.

The vitamin content of Philippine foods.—III, Vitamin B in various fruits and vegetables, A. J. HERMANO and G. SEPULVEDA, JR. (*Philippine Jour. Sci., 54 (1934), No. 1, pp. 61–73, pl. 1*).—In this continuation of the series of papers noted previously (E. S. R., 72, p. 282), data are reported on the vitamin B (B_1) content of 109 samples of vegetables and fruits purchased chiefly in the local markets of Manila, with a few from Baguio in the Mountain Province. The curative method with pigeons was followed, using graded doses of the materials to be tested. Materials which were curative in doses of 1 and 2 g were given +++ values, in doses of 3 and 4 g ++, of 5 and 6 g +, and above 6 — values. Fruits were fed raw and vegetables cooked with a little water according to the Filipino method.

Among the materials giving +++ values were leaves and shoots of amaranth (*Amaranthus viridis*), vinespinach (*Basella rubra*), chili (*Capsicum frutescens*), endive (*Cichorium endivia*), winter squash (*Cucurbita maxima*), sweetpotato (*Ipomoea batatas*), lettuce (*Lactuca sativa*), spinach (*Spinacia oleracea*), and New Zealand spinach (*Tetragonia expansa*); cauliflower (*Brassica oleracea botrytis*), string beans (*Vigna cylindrica*), and Chinese radish (*Raphanus sativus*).

Among the materials with a ++ value were okra (*Abelmoschus esculentus*), sweet pepper (*Capsicum annuum*), papaya (*Carica papaya*), chayote (*Sechium edule*), eggplant (*Solanum melongena*), tomato (*Lycopersicum esculentum*), and carrots (*Daucus carota*).

The materials with a + value included kale (*B. oleracea acephala*), sugar-apples (*Anona squamosa*), ripe bananas (*Musa sapientum*), and fresh rhizomes and leaves of the onion (*Allium cepa*) and garlic (*A. sativum*).

Studies in pernicious anaemia of pregnancy.—Part VI, Tropical macrocytic anaemia as a deficiency disease, with special reference to the vitamin B complex, L. WILLS (*Indian Jour. Med. Res., 21 (1934), No. 4, pp. 669–681, figs. 8*).—This continuation of the series of papers, some of which have been noted previously (E. S. R., 65, p. 297), constitutes the complete report of an investigation noted from a preliminary report (E. S. R., 70, p. 425). The preparations of one or more of the factors of the vitamin B complex which were tested clinically in cases of true macroscopic tropical anemia included dried distillery yeast, an aqueous extract of washed brewery yeast, various preparations of marmite, the acid clay adsorption product of vitamins B_1 and B_4, and a vitamin B_2 extract from egg white.

The various concentrates of the B vitamins proved entirely inactive, while marmite and certain vitamin B-(complex) free fractions were curative. From the properties of the curative fractions it is concluded that the hemopoietic factor in marmite is water-soluble, heat-stable in acid medium and partially resistant to autoclaving in an alkaline medium, and is not precipitated or inactivated by 80 percent alcohol.

The disease, both in pregnant and nonpregnant women and in men, is thought to be due to a simple food deficiency and not a conditioned food deficiency as in true pernicious anemia.

Nomenclature of vitamin B_2, B. C. GUHA (*Nature [London], 135 (1935), No. 3410, pp. 395, 396*).—The suggestion is made that the term vitamin B_2 be reserved for the entire complex which supplements the usual vitamin B_1-deficient diet for growth in rats, and that the various factors of which it may be composed be indicated "by their special characteristics or methods of assay—for example, flavine, antidermatitis factor, anticataract factor, etc."

Identity of vitamin B_2 and flavine and the nomenclature of vitamins, B. C. P. JANSEN (*Nature [London], 135 (1935), No. 3407, p. 267*).—Attention is called to the confusion concerning the identity of vitamin G (B_2), the P-P factor, and flavine. The author suggests a different nomenclature for the vitamins, involving omission of the customary letters with the following substitutions: The antixerophthalmic vitamin (provisionally) for vitamin A, "aneurin" for vitamin B (B_1), flavine for that part of vitamin G now identified with the flavines, ascorbic acid for vitamin C, calciferol for the form of vitamin D originally given that name with a new name for the antirachitic factor in cod-liver oil, and the sex vitamin or antisterility vitamin (provisionally) for vitamin E.

The note closes with the comment that "it is a pity that there is no international committee to regulate this nomenclature."

On the occurrence of vitamin B_2 (= vitamin G) in sake and sake-kasu (pressed cake), F. INUKAI, T. HIGASI, and W. NAKAHARA (*Bul. Agr. Chem. Soc. Japan, 10 (1934), No. 7-9, pp. 135-140, figs. 3*).—Sake-kasu, the press cake obtained in the preparation of Japanese sake or rice wine, was found to be a good source of vitamin G (B_2). The material was fed to young rats in 8-g (dry weight) daily portions as the sole source of vitamin G in a vitamin B- and G-deficient diet supplemented by oryzanin as the sole source of vitamin B. An acid earth adsorbate of an extract of sake-kasu was found to be deficient in vitamin B (B_1) but rich in vitamin G (B_2). Raw sake (rice wine) was found to contain vitamin G, but heated sake or commercial bottled sake to be deficient. It is noted that sake-kasu is often consumed in Japan as an accessory food.

Synthetic compound with vitamin B_2 activity, R. KUHN (*Nature [London], 135 (1935), No. 3405, p. 185*).—Referring to the lecture on carotene and flavines noted previously (E. S. R., 72, p. 279), the author states that "the statement that a catalytically active compound results by combination with the colloidal carrier of the 'yellow enzyme' of O. Warburg and W. Christian is incorrect, both for the natural and synthetic pigment, insofar as experiments in vitro are concerned. . . . In vivo, on the other hand, a combination of both pigments with phosphoric acid and protein to form yellow enzymes apparently takes place. In this sense only does the synthesis of a compound with vitamin B_2 activity represent also the first synthesis of the active group of an enzyme."

The vitamin G content of black-eyed peas, F. BANKSTON and M. L. GIDDINGS (*Jour. Home Econ., 26 (1934), No. 10, pp. 640, 641, fig. 1*).—Dried black-eyed peas were found to be a rather poor source of vitamin G, containing approximately 1.4 units per gram.

Liberation of vitamin B_2 (vitamin G) adsorbed on acid earth by the action of pancreatin, W. NAKAHARA, F. INUKAI, and S. KATO (*Bul. Agr. Chem. Soc. Japan, 10 (1934), No. 10-12, pp. 176-184, figs. 10*).—Pancreatin, but not pepsin, was found to have the property of liberating vitamin B_2 from an acid adsorbate of an acid-alcohol extract of fresh beef liver. The vitamin as thus

liberated was found to be utilized more completely by the experimental rats than in the form of the adsorbate.

The fact that pepsin does not have the property of liberating the vitamin while trypsin does is thought to suggest that when vitamin B_2 (G) is administered in the form of an adsorbate it is liberated in the intestines rather than the stomach.

The biological origin of vitamin C [trans. title], J. MOSONYI (*Hoppe-Seyler's Ztschr. Physiol. Chem., 230 (1934), No. 1–6, pp. 240–244*).—The suggestion that the compound 3-oxyacetonylacetone, described by Henze as an intermediate product involved in the conversion of fat to carbohydrate, might also take part in the synthesis of ascorbic acid was first tested on guinea pigs. Daily doses of from 10 to 20 mg of the compound known as "Ketol" were administered both orally and subcutaneously to scorbutic guinea pigs. Aside from a slight increase at first in food consumption and weight following the subcutaneous injection, there were no favorable effects, and typical scurvy symptoms were shown on histological examination at autopsy.

Rats were then used, and the possible effect of the Ketol was studied by determining the ascorbic acid content of the adrenals as a measure of vitamin C synthesis. In normal rats the average content of ascorbic acid as thus determined was 2.08 mg per gram of adrenal. In 3 rats receiving 10 mg ascorbic acid by mouth for 5 days the average value was 2.59 mg, in 4 receiving the same amount by mouth for 5 or 6 days 2.55 mg, and in 3 receiving 30 mg by subcutaneous injection for 3 days 2.5 mg per gram of adrenal. The similar increase for ascorbic acid and for Ketol is considered to indicate that the Ketol is an intermediate product formed in ascorbic acid synthesis.

Synthesis of vitamin C by luteal tissue, G. BOURNE (*Nature* [*London*], *135 (1935), No. 3404, pp. 148, 149*).—Evidence suggesting that the luteal tissue is capable of synthesizing vitamin C is noted briefly. Three groups of guinea pigs, (1) pregnant females, (2) untreated virgin females, and (3) young virgin females receiving 50 rat units of antuitrin S a day by subcutaneous injection, were placed on a vitamin C-free diet. All of the animals except the pregnant ones lost weight, and at the end of 2 weeks all of the untreated animals (group 2) had died of typical scurvy, 2 of the treated animals in group 3 had died of acute infection but with no symptoms of scurvy, and all of the others were active and showed no signs of scurvy. It is noted that the evidence that luteal tissue is capable of synthesizing vitamin C does not disprove its synthesis by the fetus. "It is probable that the synthesis takes place first in the corpus luteum and, once the fetus is developed, it either takes over or supplements the vitaminogenic function of the luteal tissue."

Parallelism between vitamin C and chlorophyll [trans. title], A. GIROUD, R. RATSIMAMANGA, and C. P. LEBLOND (*Compt. Rend. Soc. Biol.* [*Paris*], *117 (1934), No. 32, pp. 612–614*).—Determinations of ascorbic acid by the Harris-Ray modification of the Tillmans method in chlorophyll- and nonchlorophyll-containing tissues of various plants are reported, with the conclusion that an intimate relationship exists between the presence of chlorophyll and vitamin C. Among the data reported for food plants are parsnips, 0.82 mg ascorbic acid per gram of fresh material in the leaf and 0.03 mg in the root; beets, 0.42 mg in the leaf and 0.02 in the root; and lettuce, outer green leaves 0.31 mg and white inner leaves 0.06 mg. Numerous determinations on mushrooms gave an average value of 0.05 mg per gram.

Vitamin C content of tissues of laboratory animals under various pathological conditions, E. HARDE and H. R. BENJAMIN (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 4, pp. 651–653*).—In this preliminary report further data are

given on the ascorbic acid content, as determined by the silver nitrate test (E. S. R., 72, p. 880), of the adrenals of guinea pigs showing various pathological conditions, together with values obtained by the 2,6-dichlorophenolindophenol titration for various tissues of guinea pigs and monkeys infected in different ways.

In general a reduction in the ascorbic acid content of the tissues was found to accompany infections and intoxications.

Vitamin C content of twenty-one Massachusetts grown varieties of apples, G. G. SMITH and C. R. FELLERS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), Sup., pp. 89–95*).—In this complete report of an investigation at the Massachusetts Experiment Station noted previously from progress reports (E. S. R., 72, p. 880), tables are included of previously reported data from various sources on the vitamin C content of apples and of summarized data from the present investigation. The varieties tested by the authors were classified according to their vitamin C potency as follows: Very good (those requiring from 4 to 6.5 g daily as a protective dose for guinea pigs), Baldwin, Northern Spy, Ben Davis, and Winesap; good (protective dose from 7 to 10 g), Esopus (Spitzenberg), Rome Beauty, Red Astrachan, King, Roxbury Russet, Rhode Island, and Stayman; fair (protective dose from 10.5 to 15 g), Arkansas, Gravenstein, Wealthy, Cortland, King David, and Golden Delicious; and poor (protective dose from 16 to 25 g), Jonathan, Delicious, Tolman, and McIntosh.

A limited amount of data on several varieties tested for at least two successive seasons and several times during the same season indicated that seasonal or other variations, except storage (E. S. R., 69, p. 902), do not affect the vitamin C content of apples to any extent. Of the varieties tested, the Baldwin, Rhode Island Greening, Arkansas, King, and Gravenstein were triploid, but only one of these was in the group richest in vitamin C. It is concluded that there is no apparent correlation between the vitamin C content of an apple variety and its chromosome number, as suggested at one time by Crane and Zilva (E. S. R., 66, p. 623).

Vitamin C in Indian food-stuffs, A. R. GHOSH and B. C. GUHA (*Jour. Indian Chem. Soc., 12 (1935), No. 1, pp. 30–36, figs. 2*).—The ascorbic acid content of trichloroacetic acid extracts of various foodstuffs (India) has been determined by titration with 2,6-dichlorophenolindophenol, with glacial acetic acid introduced to inhibit to some extent the decolorization by trichloroacetic acid. In the case of ungerminated and germinated mung beans, the vitamin C content was also determined by prophylactic experiments with guinea pigs. The titrimetric value of the germinated beans was much lower than the biological value. The protective dose for guinea pigs was 4 g daily, while titrimetrically only 0.16 mg ascorbic acid appeared to be present in the trichloroacetic acid extract of this quantity of the germinated bean.

Of the various Indian foodstuffs investigated, the guava (*Psidium gujava*), the mango (*Mangifera indica*), and the lichi (*Nephelium lichi*) appeared to be the richest sources of ascorbic acid, with values of 1.04, 0.69, and 0.48 mg per gram of fresh foodstuff, respectively. Examination of the mango in the bud, unripe, and ripe stages showed a progressive decrease in ascorbic acid during the devolpment of the fruit. It is also noted that the same phenomenon was observed in another study with the guava.

Histochemical studies on vitamin C in the organism [trans. title], A. GIROUD and C. P. LEBLOND (*Bul. Soc. Chim. Biol, 16 (1934), No. 8, pp. 1359–1365, figs. 5*).—This is a general discussion of the distribution of vitamin C in various organs and tissues of the body, as determined microscopically by means of the silver nitrate reducing test (E. S. R., 72, p. 421).

Diagnosis of vitamin-C subnutrition by urine analysis, L. J. Harris and S. N. Ray (*Lancet [London], 1935, I, No. 2, pp. 7–77, figs. 4*).—This paper consists of a brief summary and discussion of an extension of the application of the authors' modification of the Tillmans titration test for ascorbic acid to the diagnosis of vitamin C subnutrition in human beings (E. S. R., 72, p. 568). Further directions are given for carrying out the test on urine.

Observations on a number of infants suffering from manifest scurvy or with a history of vitamin C underfeeding, and on the same subjects after the administration of large doses of vitamin C as orange or pineapple juice or ascorbic acid, showed that scorbutic or hypovitaminous infants tend to excrete less vitamin C than do well-nourished infants of the same age. Following large doses of vitamin C, no increase takes place at first in the ascorbic acid content of the urine of infants suffering from vitamin C deficiency but a large increase in that of normal infants. After cure, the infants which have suffered from lack of vitamin C behave like normal infants both in the output of vitamin C on ordinary diets and in response to test doses. Similar results were obtained with older children and adults, the response to vitamin C dosage varying with the state of saturation of the subject.

In testing the degree of saturation, a routine dose of 100 mg of ascorbic acid is recommended for infants and 600 mg for adults, with intermediate doses for the intervening ages according to body weight. If the test gives no response in increased output of ascorbic acid in the urine, a state of unsaturation is indicated. To determine the degree of unsaturation the dose is repeated daily until there is a response in increased output in the urine.

The daily output of vitamin C in the urine is thought to be a more stable measure of the state of vitamin C nutrition than the concentration in the urine, since the latter fluctuates with the volume of urine passed. "Nevertheless, if a child is known to be excreting neither more nor less than an average bulk of urine, and the concentration of ascorbic acid is found to be consistently above the limit of 0.01 to 0.02 mg per cubic centimeter, it may be safely assumed that his vitamin reserves are adequate. The same argument applies to an adult, except that the level of 0.02 to 0.03 mg per day may be substituted for 0.01 to 0.02."

Data are also reported on the ascorbic acid content of breast milk and cow's milk. The median and average values for 3 samples of breast milk were 0.06 and 0.056 and of 7 samples of cow's milk at the same season of the year (June and July) 0.017 and 0.018 mg per cubic centimeter, respectively. Corresponding values for 18 samples of cow's milk in October were 0.02 and 0.02 mg per cubic centimeter, respectively.

A comparison of the results obtained in the capillary resistance and urine tests for several adults on diets low and high in vitamin C showed good correlation. The urine analysis method is considered, however, to have certain advantages over the capillary resistance test in that "(1) it is more truly specific, (2) it expresses results in a more accurately quantitative form, and (3) repeated measurements can be made at any time instead of at intervals of 2 to 3 weeks only."

Vitamin C in bulk (*Lancet [London], 1935, I, No. 2, p. 160*).—In this editorial comment on recent literature on ascorbic acid, including the paper by Harris and Ray noted above, the protective dose of ascorbic acid for a man is estimated at 50 mg a day on a liberal basis. The possibility of obtaining ascorbic acid readily from food materials, together with the fact that active ascorbic acid has actually been synthesized, is thought to indicate that "the problem of transport and storage of vitamin C for Arctic sledging parties and remote

climbing expeditions is completely solved. In considering further possibilities it should not be forgotten that *l*-ascorbic acid, active vitamin C, has actually been synthesized, though not as yet on any considerable scale."

Ascorbic acid and thiosulphate in urine, M. van Eekelen (*Nature* [*London*], *135* (*1935*), *No. 3401, p. 37*).—It is noted briefly that the reducing substance occasionally present in urine and which interferes with the 2.6-dichlorophenol-indophenol test for ascorbic acid is thiosulfate, and that it can be separated from the ascorbic acid by precipitation with mercuric acetate or barium salts.

Ascorbic acid and blood catalase.—II, The determination of vitamin C deficiency [trans. title], G. Török and L. Neufeld (*Klin. Wchnschr.*, *13* (*1934*), *No. 51, pp. 1816–1818*).—In continuation of the series noted previously (E. S. R., 73, p. 277), evidence is presented leading to the conclusion that the determination of the catalase content of the blood before and immediately after the intravenous injection of ascorbic acid can be used to detect latent vitamin C deficiency. The method is based upon the results obtained in the previous study with experimental animals. For infants and children the recommended dose is 50 mg of ascorbic acid.

Infantile scurvy treated with synthetic ascorbic acid, A. D. C. Bell (*Lancet* [*London*], *1935, I, No. 10, p. 547*).—This case report of complete cure of scurvy in an 8-month-old infant by administration of synthetic ascorbic acid is thought to be "the first fully reported case of the cure of a deficiency disease by the administration of a synthetic vitamin." The treatment consisted of a daily dose of 50 mg of synthetic ascorbic acid (equivalent to the juice of about 2 lemons) by mouth as a supplement to a diet of boiled milk and water, with the addition of cane sugar and with 4 teaspoonfuls of 50 percent cod-liver oil emulsion daily, as the infant was suffering from rickets as well as acute scurvy. Improvement was noted within 24 hr. after the initial dose of ascorbic acid and was so marked in 3 days that the dose was reduced to 30 mg daily, with steady and uneventful further progress.

Ascorbic acid and infantile scurvy, W. Sheldon (*Lancet* [*London*], *1935, I, No. 12, p. 701*).—A brief report is given of the successful use of ascorbic acid (one 5-mg tablet a day) in the prevention of scurvy in a 19-month-old infant under treatment for severe celiac disease and unable to tolerate even small doses of fruit juices.

The antiscorbutic action of the crystalline lens and its reductone and sulfhydryl content [trans. title], H. v. Euler and M. Malmberg (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, *230* (*1934*), *No. 1–6, pp. 225–230*).—The literature on the reducing power and presumably vitamin C content of the crystalline lens of the eye is reviewed, and further data are reported in support of the belief that the crystalline lens of the various species contains vitamin C. In the examination of autopsy material an average value of 0.2 mg ascorbic acid per gram of fresh lens was found in the normal human eye and from 0 to 0.05 mg per lens in cases of cataract. Ox eye lens was estimated to contain about 1 mg ascorbic acid per lens and the lens from various fish from 0.32 to 1.04 mg per gram. In feeding tests on scorbutic guinea pigs both ox lens and fish lens had curative properties.

Antiscorbutic activity of ascorbic acid isolated from Japanese green tea, S. Maruyama (*Inst. Phys. and Chem. Res.* [*Tokyo*], *Sci. Papers*, *27* (*1935*), *No. 568, pp. 10–12, fig. 1*).—The investigation noted previously (E. S. R., 72, p. 586) has been completed by testing ascorbic acid crystals from Japanese green tea and the juice of the Japanese lemon, Natumikan, for vitamin C by feeding experiments on guinea pigs. Both materials had curative properties when fed in doses of 0.5 mg daily.

Dosage of ascorbic acid (*Lancet [London], 1935, I, No. 17, pp. 999, 1000*).—This is a brief summary of recent literature on the use of ascorbic acid in the treatment of human scurvy, together with a discussion of probable requirements.

Calcium and phosphorus content of the offspring after feeding vitamin D to the mother rat, W. W. Swanson and L. V. Iob (*Amer. Jour. Diseases Children, 49 (1935), No. 1, pp. 43–46*).—The ash of new-born litters from a group of rats the mothers of which had received 0.12 cc of viosterol 250 D daily throughout pregnancy, in addition to a basic diet containing 302 mg of phosphorus and 418 mg of calcium per 100 g, was found to contain 9 percent more calcium and 11 percent more phosphorus than the ash of the litters in the control group. In the group in which the mother rat received 0.2 cc of cod-liver oil daily, the ash of the litters contained 10 percent more calcium and 12 percent more phosphorus than that of the litters from the control group. When compared in Steenbock units, the relation between the dosage of viosterol and that of cod-liver oil bringing about these similar changes in ash content was found to be about 150: 1.

The effect of visible radiation and eosin on the rachitic rat, A. Szczygiel and J. H. Clark (*Amer. Jour. Hyg., 21 (1935), No. 1, pp. 224–228*).—The administration of eosin in quantities of from 1 to 5 mg daily for 5 weeks was found to give no protection against rickets in rats on the McCollum rickets-producing diet 3143 and exposed to visible light.

The transmission of ultraviolet radiation through Chinese window papers, S. Y. Ch'en, C. Y. Meng, and W. Band (*Jour. Opt. Soc. Amer., 25 (1935), No. 3, pp. 67–70, figs. 7*).—Several representative samples of Chinese window paper were analyzed quantitatively for light transmission and found to have a total transmission of visible light (4,354 a. u.) ranging from 38 to 72 percent and of ultraviolet light (2,967 a. u.) from 16 to 41 percent. Oiling the papers with mineral oil increased only the visible transmission, but oiling with a tung oil increased the ultraviolet transmission as well.

It has been suggested that the almost universal use of paper windows in oriental homes may be responsible to some extent for the lower incidence of rickets among oriental than occidental children. The advisability is suggested of using such window materials in oriental hospitals on account of the high cost of ultraviolet-transmitting glass.

Rickets: Control with fifty units (Steenbock) of cod liver oil vitamin D concentrate in milk, D. J. Barnes (*Amer. Jour. Diseases Children, 48 (1934), No. 6, pp. 1258–1267*).—A daily dose of 50 Steenbock units of vitamin D, administered in the form of vitamin D milk as prepared by the Zucker process (E. S. R., 69, p. 154), was found to be fully protective against rickets from November or December to April in 32 normal infants, and to produce slight but definite healing of rickets in 6 infants showing slight roentgenographic signs at the beginning of the experiment. In a control group of 25 without antirachitic treatment during the winter, 14 showed active rickets in April.

The conclusion of Hess and Lewis (E. S. R., 70, p. 136) that the ratio is 40: 240 for the vitamin D potency of irradiated milk and cod-liver oil is thus considered to be invalid.

The vitamin of reproduction and the fat-soluble vitamins of growth [trans. title], L. Randoin and R. Netter (*Bul. Soc. Chim. Biol., 16 (1934), No. 4, pp. 581–594, fig. 1*).—This is a general discussion, with numerous references to the literature, of the possible relationship between vitamin A, vitamin E, and the active carotenoids. Properties of vitamin E are enumerated, which, in the opinion of the authors, indicate that the vitamin is either a carotenoid or a

substance closely resembling carotenoids in properties and distribution in nature.

A list of 34 references to the literature is appended.

What is malnutrition? (*Lancet [London], 1935, I, No. 7, pp. 385, 386*).—In this editorial discussion the opinion is expressed that field observations and clinical research have lagged behind experimental research in nutrition, and that simple but extensive clinical and social researches organized on a large scale are necessary to reveal "how people live, what they eat, and what improvement in their physique and health may be promoted by a better diet."

The effect of inorganic iron with and without ultraviolet irradiation upon the prevention and cure of nutritional anemia, E. J. ANDES and H. H. BEARD (*Amer. Jour. Physiol., 108 (1934), No. 1, pp. 91–98*).—This is the complete report of an investigation noted previously from a preliminary report (E. S. R., 71, p. 569).

The development of liver therapy in pernicious anaemia, G. R. MINOT (*Lancet [London], 1935, I, No. 7, pp. 361–364*).—In this Nobel lecture, the author outlines his investigations with W. P. Murphy leading to the discovery of the beneficial results of liver therapy for pernicious anemia and the subsequent developments concerning the principles of liver therapy, the nature of the reticulocyte response, and the relation of the gastro-intestinal canal to pernicious anemia.

What should a patient with arthritis eat? W. BAUER (*Jour. Amer. Med. Assoc., 104 (1935), No. 1, pp. 1–6*).—In this address, delivered at the 1934 meeting of the American Medical Association, the author states that the first requisite in prescribing a diet for arthritis is to determine the type of arthritis involved. With the exception of gout, for which a diet of low purine content is indicated, there is no specific diet for arthritis of known origin except that which would be ordinarily prescribed for the particular disease or etiologic agent responsible for the arthritis. The dietary treatments for degenerative or hypertrophic arthritis and proliferative or rheumatoid arthritis are discussed separately. "In degenerative arthritis, diet is indicated only in the presence of obesity, and then it should be sufficiently low in calories to allow weight reduction but adequate in every other respect. There is no evidence to prove that a low carbohydrate diet is indicated in rheumatoid arthritis, nor is there any proof that it is efficacious in curing the disease. Patients with rheumatoid arthritis should eat a diet high in calories (unless they are overweight), high in vitamins, and adequate in respect to calcium, phosphorus, and iron."

A diabetic manual for the mutual use of doctor and patient, E. P. JOSLIN (*Philadelphia: Lea & Febiger, 1934, 5. ed., rev., pp. VIII+17–224, pls. 2, figs. 49*).—A revision of this well-known volume, earlier editions of which have been noted (E. S. R., 51, p. 770).

Dental decay as an indicator of a dietary fault, N. P. LARSEN, M. R. JONES, and G. P. PRITCHARD (*Amer. Jour. Diseases Children, 48 (1934), No. 6, pp. 1228–1233, figs. 2*).—The authors' theory that dental decay may be prevented and corrected by a diet in which the carbohydrates with an acid residue, such as rice, are replaced by carbohydrates with an alkaline residue, such as potato and poi or steamed taro, receives support in this report of a feeding demonstration conducted on a plantation in Hawaii. For a period of from 12 to 15 mo., one group of infants received rice and breast milk from rice-eating mothers, a second rice and cow's milk, and a third poi and potatoes in place of rice. The first two groups had a small amount of vegetables and some eggs and the third group slightly more vegetables. Diet 1 was neutral, diet 2 slightly base-forming, and diet 3 decidedly base-forming.

The infants in group 3 grew more rapidly in height and weight than the other two groups and showed very little evidence of dental decay, 7 percent, as compared with 95 and 100 percent for the other two groups. A decrease in infant morbidity and mortality on the plantation during the past 4 yr. is attributed largely to educational efforts to substitute alkaline starches for acid starches in the diet.

"The observations suggest that in countries with warm climates where an acid residue diet high in carbohydrate is prevalent, the exchange of the acid starch for an alkaline starch and the addition of a small amount of vegetables will alter dental structure and general growth as well as affect infant morbidity and mortality. It may suggest that some of the concepts of racial immunity or lack of immunity to disease may be dietary rather than hereditary."

Changes in the teeth and bone in chronic fluoride poisoning, C. J. SUTRO (*Arch. Path., 19 (1935), No. 2, pp. 159–178, figs. 7*).—This paper reports gross and microscopic changes in the teeth and bones in rats receiving 25, 50, or 75 mg of sodium fluoride per kilogram of body weight, in addition to diets adequate and inadequate in calcium and in some instances supplemented with yellow phosphorus, a 5-percent solution of sodium acid phosphate, or parathyroid extract (injected subcutaneously). Photographs, microphotographs, and roentgenograms are included.

Iodine and thyroid hyperplasia.—I, The iodine content of human skimmed milk from goitrous and nongoitrous regions, R. G. TURNER (*Amer. Jour. Diseases Children, 48 (1934), No. 6, pp. 1209–1227*).—This investigation, in which the author was assisted by M. Z. Weeks, has been noted essentially from a preliminary report (E. S. R., 70, p. 138).

HOME MANAGEMENT AND EQUIPMENT

Laundry equipment and methods, E. CARSE and H. JEFFRYES (*Nebraska Sta. Circ. 49 (1934), pp. 16, figs. 2*).—This circular contains practical advice for the homemaker, based upon a study of home laundry problems, on the selection and arrangement of home laundry equipment; the selection and use of stain removers, water softeners, and soap; and methods of washing white and colored clothes, articles of silk or synthetic fabrics, woolens, curtains, draperies, and slip covers.

MISCELLANEOUS

Report of the director [of the Storrs Station], 1934, W. L. SLATE (*[Connecticut] Storrs Sta. Bul. 199 (1934), pp. 28*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

International directory of agricultural associations adhering to the C. I. P. A.—I, Europe and Africa (*Guide international des associations agricoles adhérentes à la C. I. P. A. Vol. I, Europe-Afrique. Roma: Inst. Internatl. Agr., 1934, vol. 1, pp. X+172*).—This directory reports data as to the history, aim, resources, activities, and personnel of the agricultural associations affiliated with the Permanent International Commission of Agricultural Associations. Volume 1 deals with about 70 such associations in Europe and Africa.

NOTES

Connecticut [New Haven] Station.—The State appropriations for the work of the station during the coming biennium remain approximately the same as for the past 2 yr., except that $25,000 has been made available for research on the Dutch elm disease. The State planning board, which has been functioning as the Governor's planning board and carrying on a research program under the chairmanship of Director W. L. Slate, has been given legal status by the general assembly. Director Slate has been redesignated as chairman.

Dr. Donald F. Jones, head of the genetics department, has been granted leave of absence to be spent mainly in special research at the California Institute of Technology.

Purdue University and Indiana Station.—Dr. Charles S. Plumb, director of the station from 1891 to 1902, was awarded the honorary degree of doctor of science from the university on June 12.

A new pavilion is being completed on the Purdue Farm at Bedford, capable of seating 2,000 people. An addition to the cattle barn is also well under way.

Kansas College.—A miniature dough mixer has been constructed by the department of milling industry. This is made on the same mechanical principles as larger experimental mixers now in use in the department, but will mix a dough of only 15 to 25 g of flour or wheat meal, as is frequently desirable in tests of wheat varieties. Rowland J. Clark has been appointed associate professor of milling industry beginning September 1.

Louisiana Station.—The funds to be received by the station from State sources during the coming year will be approximately $6,000 greater than last year, making the total income $184,433.87.

Dr. D. C. Neal, senior pathologist in the U. S. D. A. Bureau of Plant Industry, has been transferred from the Federal cotton station at Greenville, Tex., to continue his work on diseases of cotton. Franklin L. Davis, soil chemist at the Alabama Station, has been appointed associate soil technologist. R. E. Wright has been appointed in charge of the horticultural work at the North Louisiana Station, with a part of his time available for forage crops.

Missouri Station.—The station announces the development through selection from a Mississippi source of a strain of barley named Missouri Early Beardless. This is a hooded barley that has shown itself to be generally winter resistant in the southern two-thirds of the State. When sown late in August or early in September on a seedbed of medium to high fertility, it usually has produced 90 days of fall pasture, followed by a grain crop ready to harvest during the first week of June. Approximately 40,000 bu. of certified seed are available this year by farmers in Missouri who cooperated with the station in its development.

Washington College and Station.—At the June commencement six master's degrees and four doctorates were granted to candidates who majored in agriculture.

Dr. C. D. Schwartze has been appointed assistant horticulturist of the station, with headquarters at the Western Washington Station at Puyallup and effective July 1. Dr. Ralph M. Weihing has been appointed instructor in agronomy and assistant agronomist, also effective July 1. Clarence I. Seely has been appointed acting superintendent of the Adams Substation at Lind, replacing H. M. Wanser, who is on leave with the Soil Conservation Service.

EXPERIMENT STATION RECORD

Vol. 73 October 1935 No. 4

EDITORIAL

THE AGRICULTURAL EXPERIMENT STATIONS IN 1934

The recent publication by the Office of Experiment Stations of its annual report on the work and expenditures of the agricultural experiment stations for the fiscal year ended June 30, 1934, extends by another year the period for which summarized information is available for this group of institutions. In much the same way as in former years this report deals primarily with the use of $4,430,973 of Federal funds provided by the Hatch, Adams, Purnell, and supplementary acts for the support of these stations in the several States, Alaska, Hawaii, and Puerto Rico. It also, however, gives the customary general survey of the work of these stations as a whole, and discusses questions of their organization, administration, personnel, research facilities, needs, trends, and public service.

The total income of the stations for the year from all sources was $14,188,455. This was a decrease of $1,388,178, or 8.9 percent, from the previous year and of $3,867,827 from the high-water mark of 1931. The total was approximately the same as that provided for 1928.

The Federal appropriations to the States under the Hatch, Adams, and Purnell Acts, aggregating $4,361,000, were maintained in full, and sales receipts were greater by $158,955, but State support receded by $1,035,778. Reductions in State income were reported by 37 of the stations, ranging in amount from $617 to $388,750. At the same time 15 stations, as compared with 8 in 1933, reported increases in State support, the total of these increases being $231,600.

Despite the continued shrinkage in revenues, necessary research facilities were fairly well maintained and a number of improvements and additions to land holdings were made possible through various emergency funds and private donations. For the year the stations reported $1,528,986 expended for buildings and equipment, including the purchase of books and journals, scientific apparatus, farm implements and machinery, and livestock. This amount, although greater by $76,659 than the amount so used in the preceding year,

was still more than $1,000,000 below the maximum expenditure of $2,565,317 reported for 1931.

Among the major developments were the construction of a soil tillage experiment station at the Alabama Station under a grant of $110,975 from the Public Works Administration; the erection of a veterinary laboratory and barn costing $31,100 at the California Station; the gift of a tract of 609 acres for a research station in animal husbandry and forestry in Georgia; the purchase of 200 acres of land for the Iowa Station; and the undertaking of several Civil Works Administration projects in New Jersey aggregating over $100,000 in cost and in Oklahoma about $20,000 (of which $18,000 was for greenhouse construction).

Although the expenditures for publications continued to decrease, dropping from $278,220 to $246,696, the published output of the stations was substantially the same as in the previous year. In the regular series the number of publications received by the Office decreased from 862 to 842, of which 215, or over one-fourth, dealt with improvement in rural economic and social conditions. There were also 1,373 articles reporting or based on station work contributed to 63 outside or technical journals, and 30 of the stations contributed or collaborated in 90 articles published in the *Journal of Agricultural Research*.

As in previous years the projects and programs of the stations included research into almost every phase of farming and rural life. Increased emphasis was placed on efficient and quality production and on the economic and social aspects essential to an effective program and policy of rural life betterment. Station research continued to be profoundly influenced by active participation in various State and national recovery and readjustment activities of a more or less temporary and emergency character, and an increased number of active and new projects was an evidence of attempts by the stations to adapt their research programs to emergency and adjustment problems. The fundamental research which furnishes an essential basis for these activities was on the whole, however, well maintained, although with reduced personnel and inadequate financial support.

The report makes clear that the need as well as the opportunities for coordination and cooperation between the State experiment stations and the Department was greater during the year than in any other similar period. "It is safe to say without reservation, also, that there was more effective coordination and cooperation than in any other similar period. This applies not only to coordination and cooperation in research, but to more effective use of accumulated findings from research, physical plant facilities, and research staff.

"Coordinated research involving cooperation of an individual State station and a bureau of the Department would seem to have

become a fully established procedure. Practically the entire research program of some bureaus and of major research divisions is conducted in cooperation with State stations. During the year 685 formal cooperative undertakings involving 760 separate agreements in which the Department of Agriculture and the State stations cooperated were on record. . . . The number of cooperative studies per station ranged from 1 to 44. Subjects under cooperative study covered the entire broad field of agricultural and rural life problems. Emphasis was shifted somewhat to include more studies pertaining to soil resources and land use, including soil surveys, development of pastures and forage, types of farming, and the prevention of soil losses through erosion." Other examples of investigations of regional or Nation-wide scope which received much attention were the securing of reliable information as to farm mortgage foreclosures, tax delinquencies, and land values; cotton research; and studies of hay and hay products.

Attention is also directed to the many less formal activities of the stations in relation to recovery and readjustment in agriculture. Incomplete reports from 41 of these stations before the major drought activities began show for the year that a total of 587 of their major staff members had undertaken special assignments in connection with emergency activities and programs. These included such assignments as the presidency of Federal land banks, chairmanships of State planning boards, regional, State, or local leadership of national recovery activities, and participation in various ways in many research studies of emergency character. Among the agencies concerned were the Federal Civil Works Administration; the subsistence homesteads and part-time farming projects and the Soil Erosion Service of the Department of the Interior; the Agricultural Adjustment Administration; the Federal Emergency Relief Administration; the Farm Credit Administration; the national farm housing and rural electrification surveys; and the Tennessee Valley Authority.

Thus despite decreased revenues and personnel and other serious handicaps, the stations not only had a busy year but one of much value to the Nation. As the report concludes, "the events of the past year and the unusual demand on the time and energies of the research specialists have served to emphasize as never before in peace times . . . that research is the basis for help to farmers in planning and production, reducing costs, fighting diseases and pests that attack animals and plants, and in all other problems pertaining to agriculture and rural life. It has also emphasized the need and advantage of an alert and broadly informed personnel, ready at all times to mobilize its extensive resources of exact knowledge and sound judgment for the common good."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Gmelin's handbook of inorganic chemistry.—IV, Nitrogen, pt. 1 (*Gmelins Handbuch der anorganischen Chemie. System-Nummer 4: Stickstoff. Lief. 1. Berlin: Verlag Chem., 1934, 8. ed., No. 4, pt. 1, pp. V+N282, figs. 10*).—This section of the eighth edition of this well-known handbook contains a historical sketch and takes up the occurrence of nitrogen, the changes undergone by nitrogen and its compounds in the soil, and under the general head of the element its formation and preparation, its physical, electrochemical, and chemical properties, its detection and determination, active nitrogen and its nonluminous active modification, paranitrogen, and trinitrogen.

Allocation of the free amino groups in proteins and peptides, S. GURIN and H. T. CLARKE (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 395–419, fig. 1*).—The position of the free amino groups in polypeptides and proteins was determined by benzenesulfonylation followed by hydrolysis under conditions in which the peptide linkages were opened without appreciable attack on the sulfonamino grouping. These conditions were attained by treatment at 90°–100° C. with 50 percent formic acid containing about 2 equivalents of hydrochloric or sulfuric acid for each atom of nitrogen. Several new benzenesulfonamino acids were prepared and characterized both as such and as their butyl esters. Application of the process to dipeptides of known constitution yielded concordant results. In the case of glutathione, the location of the free amino group on the glutamic acid radical was confirmed by the isolation of butyl benzenesulfonyl-*d*-glutamate.

It was further observed that "treatment of gelatin with benzenesulfochloride completely blocks the free amino groups with no apparent degradation of the protein. The sulfur introduced is not very much more (30 percent) than equivalent to the amount of amino nitrogen originally present. From the hydrolytic products, ε-monobenzenesulfonyl-*d*-lysine was isolated as its copper salt in 50 percent yield. Its identity was confirmed by conversion to ε-benzenesulfonyl-*d*-lysine phenylhydantoin and comparison with a synthetic product. At least 50 percent of the free amino groups in gelatin may, therefore, be ascribed to the ε-amino group of lysine. Not more than 0.5 percent of the free amino nitrogen in gelatin can be allocated to monoamino acids."

A reaction between α-ketonic acids and α-amino acids, R. M. HERBST and L. L. ENGEL (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 505–512, figs. 3*).—Pyruvic acid was shown to react in boiling aqueous solution with several amino acids with the formation of carbon dioxide, alanine, and aldehydic degradation products of the original amino acid. Mineral acids retarded the reaction; alkalies inhibited it completely. No recation occurred either with α-aminoisobutyric acid or with α-methylaminophenylacetic acid. Phenylpyruvic acid could be substituted for pyruvic acid, in which case phenylalanine was formed, together with carbon dioxide and aldehydes.

In the case of α-aminophenylacetic acid the reaction resulted in a "nearly quantitative" formation of benzaldehyde, alanine, and carbon dioxide:

$$CH_3{\cdot}CO{\cdot}CO_2H + C_6H_5{\cdot}CH{\cdot}NH_2{\cdot}CO_2H \rightarrow CH_3{\cdot}CH{\cdot}NH_2{\cdot}CO_2H + C_6H_5{\cdot}COH + CO_2.$$

The oxidation of the sulfur of the acetyl and formyl derivatives of d- and l-cystine in the animal body, V. DU VIGNEAUD, H. S. LORING, and H. A. CRAFT (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 519–525*).—The experiments here recorded were concerned with oxidation of the sulfur of the acetyl and formyl derivatives both of *l*-cystine and of *d*-cystine in the rabbit.

It was found that acetyl- and formyl-*l*-cystine are as readily oxidized as free *l*-cystine, whereas the corresponding derivatives of *d*-cystine are far more resistant to oxidation than *d*-cystine. The significance of these findings with respect to the oxidation of the sulfur of cystine and the hydrolysis of the acyl derivatives of the enantiomorphs of the naturally occurring amino acids is discussed.

Readjustment of salts in milk by base exchange treatment, J. F. LYMAN, E. H. BROWNE, and H. E. OTTING (*Indus. and Engin. Chem., 25 (1933), No. 11, pp. 1297, 1298*).—By treating cow's milk with such base-exchange silicates (zeolites) as greensand or crystallite, the authors of this contribution from Ohio State University found it possible to lower both the calcium and the phosphate content of the milk in such degree as to lessen the tendency to the formation of a tough curd. On treatment with suitable zeolites, the "calcium content is lowered. If the milk is acidified to about 0.3 percent before being treated with the zeolite, about 20 percent of the total calcium of the milk is removed.

"Phosphorus content is lowered. If the zeolite has been treated with sodium hydroxide previous to its contacting with milk, the calcium: phosphorus ratio in the zeolite-treated milk is about the same as in the original untreated milk.

"Sodium and potassium are kept in nearly any desired ratio by selecting the proper mixture of alkali metal chlorides for reviving the zeolite.

"Treated milk is not coagulated by rennin if 20 percent or more of the initial calcium is removed."

Larger yields of crystalline antineuritic vitamin, R. R. WILLIAMS, R. E. WATERMAN, and J. C. KERESZTESY (*Jour. Amer. Chem. Soc., 56 (1934), No. 5, pp. 1187–1191*).—This describes in detail the method previously noted (E. S. R., 71, p. 298). The process as a whole was found to give "consistent yields of antineuritic vitamin hydrochloride of approximately 5 g per ton of rice polish. This represents a recovery of about 25 percent of the amount present in the rice polish, a yield severalfold larger than heretofore reported."

On the identification of vitamin C [trans. title], N. BEZSSONOFF (*Bul. Soc. Chim. Biol., 16 (1934), No. 7, pp. 1107–1132*).—The violet color reaction of ascorbic acid, or vitamin C, was found to be specific for the grouping —COH:COH·, free or esterified. Though necessarily shown by inactive derivatives having the di-enol grouping, the reaction was accompanied, in the case of the vitamin, by a high reducing power which serves to distinguish it. By the use of the violet color reaction the molecular concentration of the di-enol grouping could be determined, and, under suitably fixed conditions, the relation between the di-enol concentration and the oxidation-reduction potential yielded a curve from which it was possible to establish the presence of the active vitamin C.

The ultraviolet absorption of vitamin C was found not to conform to Beer's law, and it is considered that the determination of the vitamin by spectrophotometric means would be difficult.

The reducing activity of vitamin C and of other biological reducing substances expressed as a function of their concentration [trans. title], N. BEZSSONOFF, A. DELIRE, and H. VAN WIEN (*Bul. Soc. Chim. Biol., 16 (1934), No. 7, pp. 1133–1150, figs. 4*).—A method, the theoretical basis of which is indicated in the preceding abstract, is given in working detail.

The color intensity produced by hydroquinone in a concentration of 0.001 mg in 1 cc in the presence of an excess of the reagent is designated the "hydroquinone unit." On the assumption that the antiscorbutic principle in lemon juice is present in the form of free ascorbic acid, the method indicated that the juice examined contained 0.5 mg per cubic centimeter of the vitamin.

Vitamin E.—II, Stability of concentrates toward oxidizing and reducing reagents, H. S. Olcott (*Jour. Biol. Chem.*, *107* (*1934*), *No. 2*, *pp. 471–474*).—Vitamin E was found to be rendered inactive by ozone, perbenzoic acid, potassium amide, potassium ethylate, and chlorine, but the chlorinated and brominated concentrates could be reactivated by boiling with zinc and hydrochloric acid in methanol. Hydrogen bromide did not attack the vitamin.

Cottonseed oil was found to be as satisfactory as wheat germ oil for the preparation of active concentrates.

Concentrates of vitamin E exhibited "a band in the ultraviolet absorption spectrum at 2,940 A. u. apparently not connected with the vitamin activity."

The experiments continue work previously recorded (E. S. R., 71, p. 731).

Products of the oxidation of thiosulfate by bacteria in mineral media, R. L. Starkey (*Jour. Gen. Physiol.*, *18* (*1935*), *No. 3*, *pp. 325–349*).—Various cultures which oxidize thiosulfate in mineral media were studied by the author of this contribution from the New Jersey Experiment Stations, with regard especially to the products of oxidation. The transformation of sodium thiosulfate by three of the cultures yielded sodium tetrathionate and sodium hydroxide. Secondary chemical reactions resulted in the accumulation of some trithionates and pentathionates, sulfate, and elemental sulfur. The secondary reactions caused a drop in pH after the initial rise. The primary reaction yielded much less energy than the reactions effected by autotrophic bacteria. No significant amounts of assimilated organic carbon were detected in media supporting representatives of these cultures. It is concluded that they are heterotrophic bacteria.

"*Th*[*iobacillus*] *novellus* oxidizes sodium thiosulfate to sodium sulfate and sulfuric acid; the pH drops progressively with growth and oxidation. Carbon assimilation typical of autotrophic bacteria was detected; the ratio of sulfate-sulfur formed to carbon assimilated was 56:1. It is calculated that 5.1 percent of the energy yielded by the oxidation of thiosulfate is accounted for in the organic cell substance synthesized from inorganic materials. This organism is a facultative autotroph.

"The products of oxidation of sodium thiosulphate by *T. thioparus* are sodium sulfate, sulfuric acid, and elemental sulfur; the ratio of sulfate-sulfur to elemental sulfur is 3 to 2. The pH decreases during growth and oxidation. The elemental sulfur is produced by the primary reaction and is not a product of secondary chemical changes. The bacterium synthesizes organic compounds from mineral substances during growth. The ratio of thiosulfate-sulfur oxidized to carbon assimilated was 125:1, with 4.7 percent of the energy of oxidation recovered as organic cell substance. This bacterium is a strict autotroph."

Methods for determining polythionates are discussed.

[Dissociation studies of yeasts] (*Michigan Sta.* [*Bien.*] *Rpt. 1933–34*, *p. 17*).—These have included a study of the dissociation of certain yeasts into smooth, rough, gonidial, and transitional forms, respectively designated by the letters S, R, G, and T.

Determination of monocalcium phosphate by means of urea, C. W. Whittaker, F. O. Lundstrom, and W. L. Hill (*Jour. Assoc. Off. Agr. Chem.*, *18* (*1935*), *No. 1*, *pp. 122–127*).—This contribution from the Bureau of Chemistry

and Soils, U. S. D. A., describes a method for the determination of monocalcium phosphate based on the reaction $Ca(H_2PO_4)_2 \cdot H_2O + CO(NH_2)_2 = H_3PO_4 \cdot CO(NH_2)_2 + CaHPO_4 + H_2O$ and on the fact that urea phosphate is soluble in alcohol while dicalcium phosphate is not. The three basic operations in the method are (1) the treatment of the sample with a large excess of urea solution to insure that the reaction goes to completion, (2) the separation of dissolved dicalcium phosphate from the resulting solution by precipitation with alcohol, and (3) the determination of P_2O_5 in the resulting alcoholic solution of urea and urea phosphate.

"Use a sample containing at least 1 g of $Ca(H_2PO_4)_2 \cdot H_2O$. (A 2-g sample is convenient for monocalcium phosphate and a 4-g sample for ordinary or double superphosphate.) Place the sample in a 100-cc volumetric flask, add 50 cc of urea solution made by dissolving 90 g of C. P. urea in 100 cc of water, and shake 4 hr. on a shaking machine (good results have been obtained by intermittent shaking by hand). Make up to volume with water, filter immediately through a dry filter, discarding the first few cubic centimeters, and take a 25-cc aliquot. Add 75–100 cc of 95 percent alcohol to this aliquot, stir well, filter, and wash the precipitate with 300–350 cc of alcohol. Make the combined filtrate and washings up to 500 cc with water and take a 25-cc aliquot. Evaporate the aliquot to dryness, and destroy the urea and any other organic matter present by again evaporating to dryness with 5 cc of hydrochloric acid and 25 cc of nitric acid. Repeat with smaller quantities of acid if urea is still present (the beaker should be practically free of solids at this point). Add 10 cc of concentrated nitric acid and a little water, neutralize with ammonium hydroxide, and render slightly acid with the nitric acid. Adjust the volume to about 75 cc, and from this point proceed with the P_2O_5 determination according to methods of analysis, A. O. A. C., [E. S. R., 55, p. 11]; 30 cc of the molybdate solution should be sufficient in every case." The P_2O_5 found multiplied by 2 gives the P_2O_5 present as monocalcium phosphate.

Accurate results were obtained on pure monocalcium phosphate and on mixtures of monocalcium phosphate with various phosphate materials. The method was also used satisfactorily to determine the P_2O_5 present as monocalcium phosphate in ordinary and double superphosphates.

Further studies on the Willard and Winter method for the determination of fluorine, D. S. REYNOLDS (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 1, pp. 108–113*).—In distilling off the fluorine content of slag, phosphate rock, and calcined phosphate, "a coating of precipitated silica, which tenaciously retains fluorine, gradually accumulates on the walls of the distillation flask. If this precipitated silica is allowed to accumulate, serious errors may arise when the flask is used successively in the analysis of samples containing widely different quantities of fluorine. Because of the liberation of fluorine from the precipitated silica, high results are likely to be obtained on the low-fluorine samples. On the other hand, low results may be obtained on the high-fluorine samples, because of the absorption of fluorine by the precipitated silica. The coating of silica is easily removed by boiling with strong sodium hydroxide solution.

"When orthophosphoric acid is used as the distillation agent, the distillate invariably contains sufficient phosphate to cause serious error in the results for fluorine. In the thorium nitrate titration of the distillate the phosphate is precipitated as thorium phosphate, with the result that the fluorine figure is correspondingly too high.

"When 0.1-g samples of phosphate rocks and slags are distilled with perchloric acid, the distillates do not contain determinable quantities of phosphate.

However, with large samples (3 g or more) of highly phosphatic materials, the distillate from the perchloric acid digestion contains an appreciable quantity of phosphate.

"In the determination of fluorine in liquid phosphoric acid, monocalcium phosphate, and other comparatively pure phosphates that contain only small quantities of fluorine, it is customary to use large samples for the analysis. With the Willard and Winter method [E. S. R., 69, p. 489], however, a large sample may lead to serious error unless the results are corrected for the fluorine equivalent to the phosphate present in the distillate, or the distillate is neutralized, evaporated to a small volume, and redistilled with perchloric acid."

Sulfhydryl and disulfide groups of proteins.—I, Methods of estimation, A. E. Mirsky and M. L. Anson (*Jour. Gen. Physiol., 18 (1935), No. 3, pp. 307–323*).—The authors describe methods for reducing protein S–S groups, for oxidizing protein SH groups, and for estimating protein S–S and SH groups.

For the determination of protein sulfhydryl groups the protein was allowed to react with cystine, and the cysteine formed was determined. That the oxidation of the SH groups was complete was indicated by a negative nitroprusside test, and that only SH groups were oxidized was indicated by the observation that cystine was reduced only by proteins giving a positive nitroprusside test. For the estimation of the S–S group in proteins, reduction to SH groups by means of thioglycolic acid was used. Neither sodium hydrosulfite nor sodium sulfite effected a complete reduction. It was found necessary in estimating the cystine content of proteins by the Folin-Marenzi method to take into account any cysteine that may be present. A method for estimating the cysteine content of proteins is described.

With these methods, estimations of the S–S and SH groups and of the cystine and cysteine contents of a number of proteins were made.

"In a denatured, but unhydrolyzed protein, the number of S–S and SH groups is equivalent to the quantity of cystine and cysteine found in the protein after hydrolysis."

Proteolysis in flours, A. K. Balls and W. S. Hale (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 1, pp. 135–140, figs. 3*).—The method quoted below is given in a contribution from the Bureau of Chemistry and Soils, U. S. D. A., together with a discussion of its theoretical basis and its results with various flours.

"The time is noted when 20 g of fat-free flour is mixed thoroughly with 100 cc of water containing 3 cc of 0.1 N hydrochloric acid. The acid is added to buffer the system to a pH of approximately 5; 15–20 cc of the flour paste is poured into a tube and centrifuged at a high rate of speed for about 1 min. (Filtration would be unsatisfactory, too slow.) The flask containing the remaining flour is placed in a thermostat at 40° C., where it should be shaken at intervals of 10–15 min. As soon as possible 10 cc of the supernatant liquid is removed from the centrifuge tube with a pipette of rapid delivery and run into a 300-cc Erlenmeyer flask; 1 cc of 1 percent *o*-cresolphthalein in alcohol is added, and the solution is titrated to a distinct red with 0.1 N alcoholic potassium hydroxide; 20 cc of 95 percent ethyl alcohol is then added to the flask, which causes the red color to disappear. The titration with alkali is continued. At the reappearance of the red color 175 cc of alcohol is added, then a final titration is made with alkali to a faint, distinct red color. The same lot of alcohol should be used throughout the experiment.

"At the end of 2 hr. another sample of the flour suspension is removed and treated exactly as before. The difference in the titrations at zero time and 2

hr. represents the extent of proteolysis. Although the quantity of enzyme present in most flours is small, the large sample used makes it possible in most cases to obtain titration differences of satisfactory size."

An improved apparatus for the determination of carbon dioxide production in physiological plant studies, F. L. Wynd (*Ann. Missouri Bot. Gard., 22 (1935), No. 2, pp. 361–363, fig. 1*).—With the help of additional safeguards against the entrance of atmospheric contaminants into the carbon dioxide absorption vessel, the author has produced a set-up of which the manipulation is simple, the refilling of the guard tubes and absorption tubes infrequent, and the accuracy improved.

"The apparatus may be operated for periods of 12 hr. and even longer, and amounts of carbon dioxide up to several grams may be determined with an experimental error of less than 1 mg if the usual analytical precautions are taken."

Assay of papain, A. K. Balls, T. L. Swenson, and L. S. Stuart (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 1, pp. 140–146, figs. 2*).—In the investigation here reported from the Bureau of Chemistry and Soils, U. S. D. A., the authors describe a method for estimating the proteinase activity of papain specimens. The method includes the digestion of casein at its isoelectric point and the subsequent determination of protein scission by an alcoholic titration.

"The time of digestion is shortened to 20 min., in order to avoid as far as possible the interference of peptidases and other ferments of subsidiary protein break-down. Specimens of papain examined in this way show the same proteinase content and widely differing amounts of subsidiary ferments."

The effect of different methods of cooling moisture-free butter samples on the moisture per cent reading, I. A. Gould (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 157–159*).—A comparison was made of different methods of treatment of the moisture pan or cup used in determining the moisture content of butter immediately after the moisture had been driven off by heating the sample over a flame. The study showed that there was no appreciable difference in the results obtained if samples were properly cooled, regardless of the method of cooling. However, if the samples were weighed while hot there was an appreciable increase in the percentage reading in every case. The differences varied from 0.1 to 0.5 percent above those obtained when the samples were cooled. The air currents set up by the hot sample were responsible for the difference.

Arachidonic acid in butter fat, A. W. Bosworth and E. W. Sisson (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 489–496*).—The authors of this contribution from the Ohio State University describe means whereby they were enabled to effect a satisfactory fractionation of the methyl esters of the fatty acids from 125 lb. of buter and record their data from the constituent C_{20} fractions.

Stearic acid and behenic acid were found in these fractions, but no arachidic acid could be isolated. Arachidonic acid was separated as an octabromide both of the acid and of its methyl ester. The relation of the isomeric forms of octabromoarachidic acid to the detection of linoleic and linolenic acids in buterfat is discussed.

A new technic for the determination of the melting points of brominated fatty acids is described. This procedure, which was devised for determinations of the melting points of substances which decompose without melting when slowly heated in the usual way, consisted in immersing the melting-point tubes into a sulfuric acid bath previously heated to various temperatures until a temperature at which the sample melted instantly was found. The brominated fatty acids here dealt with were found usually to decompose immediately after melting, with evolution of gas.

A comparison of the official reducing sugar methods in the analysis of raw cane sugars, F. W. Zerban, W. J. Hughes, and M. H. Wiley (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 1, pp. 118–122*).—It was concluded from the results reported that of the three Official methods (E. S. R., 55, p. 11) that of Herzfeld is the most reliable for the determination of invert sugar in raw sugars. Comparisons of the Herzfeld method and the Lane and Eynon volumetric method, which is a tentative method of the association, indicated that "considering that these analyses were made with different portions of the raw sugar samples, the agreement between the two methods is very good."

A comparison of methods for the determination of uric acid in human, bovine, and avian bloods, G. H. Pritham and A. K. Anderson (*Jour. Lab. and Clin. Med., 19 (1934), No. 8, pp. 892–896*).—Report is made in a contribution from the Pennsylvania Experiment Station of an investigation in which standard methods and various modifications were tested comparatively, with regard especially to the analysis of bovine and of avian (chicken) blood samples For human and for avian samples, isolation methods were preferred. The Folin method was found advantageous in that "the use of the urea-cyanide solution eliminates the formation of a troublesome precipitate which is always imminent when Benedict's method is used."

[Chemical and bacteriological investigations of the Michigan Station], F. W. Fabian and E. J. Miller (*Michigan Sta. Rpt. 1934, pp. 196–198, 204*).—These have included analyses of vinegar and prune juice.

Comparative composition and color of commercial tomato juice, J. S. Mitchell (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 1, pp. 128–135, fig. 1*).—The brands of tomato juice now on the market were found to show a rather wide variation in total solids, soluble solids, salt, acid, and color. It is noted that tomato juice should not be packed too late in the season because the flavor and color are affected adversely.

A formula for the calculation of total soluble solids from refractive index is given. A comparison of five methods of determining pH of tomato juice indicated reasonably good agreement in results.

[A study of the manufacture of cane sirup at the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1934, pp. 9–12*).—The station reports briefly upon its investigations into the composition of the juice of canes grown under abnormal conditions, and into such further technical details as color variation of juice according to variety, defecation or clarification, filtration, boiling, flavor and color of sirup, crystallization, and molds and darkening in stored sirup.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [January–February 1935] (*U. S. Mo. Weather Rev., 63 (1935), Nos. 1, pp. 43, pls. 10, figs. 11; 2, pp. 45–77, pls. 12, figs. 9*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—Intensity of Solar Radiation at the Surface of the Earth, and Its Variations with Latitude, Altitude, Season, and Time of Day, by H. H. Kimball (pp. 1–4); Routine Daily Preparation and Use of Atmospheric Cross Sections, by H. C. Willett (pp. 4–7); Meteorology and Climatology in a Teachers College, by G. E. Harding (pp. 7, 8); Analysis of a Warm "Cold Front", by A. H. Christensen (p. 9); Relation of Tropical Cyclone Frequency to Summer Pressures and Ocean Surface Water Temperatures, by C. L. Ray (pp. 10–12);

Relation of May–June Weather Conditions in Jamaica to the Caribbean Tropical Disturbances of the Following Season, by J. F. Brennan (pp. 13, 14); The Drought of 1933–34 in New Mexico, by M. J. Chambers (pp. 14, 15); Excessive Heat and the Death Rate in Kansas, by S. D. Flora (p. 16); A Useful Hygrometric Calculating Device, by L. G. Gray (pp. 16, 17); The Principles Underlying the Choice of Visibility Marks, by W. E. K. Middleton (pp. 17–19); Climatic Trend in the Pacific Northwest, by H. G. Carter (pp. 19–23); and Meteorological Office—The Observer's Handbook, London, 1934 (rev.), by W. A. Mattice (p. 24).

No. 2.—The Height of Tropical Cyclones and of the "Eye" of the Storm, by B. Haurwitz (pp. 45–49); Sounding-Balloon Observations at Omaha, Nebr., during the International Month, January 1934, by J. C. Ballard (pp. 49–52); Dust Storms, November 1933 to May 1934, by W. A. Mattice (pp. 53–55); Effects of Local Smoke on the Climate of Nashville, Tenn., by F. V. Jones (pp. 55–57); Ice Crystals and Halo Phenomena, by B. W. Currie (pp. 57, 58); Floods, Earth and Snow Slides, and an Ice Storm, from Unprecedented Precipitation in the State of Washington, January 1935, by L. C. Fisher (p. 58); January 1935, Abnormally Foggy at Boise, Idaho, by H. G. Carter (p. 59); Weather of One Season as an Indication of the Weather of the Following Season, or Seasons, at Boise, Idaho, by H. G. Carter (p. 59); and Some Problems of Modern Meteorology (rev.) (pp. 60, 61).

Microclimatology [trans. title] (*Rev. Sci. [Paris], 73 (1935), No. 9, pp. 307, 308, figs. 2*).—This article cites briefly examples illustrating the importance of microclimatological studies, particularly those having a bearing on the location and the construction of sanatoriums and improvement of conditions on farms.

Methods of observing the temperature of the air at the surface of the soil [trans. title], P. Carton (*Météorologie, n. ser., 11 (1935), No. 118, pp. 27–31, figs. 3*).—A method of making observations on the temperature of the air at the surface of the soil is described, and preliminary tests of it on turf-covered soil are reported. While the results are not considered rigorously exact, they appear to be concordant and of more agronomic value than ordinary observations.

The collection of dew, H. E. Beckett and A. F. Dufton (*Nature [London], 135 (1935), No. 3419, pp. 798, 799, fig. 1*).—Measurements of dew collected on metal sheets and corrugated iron roofs showed relatively insignificant results as regards water that may be derived from such sources as compared with that which may be obtained from rainfall.

Studies in evaporation, J. D. Wilson (*Ohio Sta. Bul. 548 (1935), p. 35*).—Records of observations on daily rates of evaporation as measured by atmometers and open pan at Wooster, Ohio, from May 1 to September 30, are summarized for 7 yr.

Man's responsibility for droughts in the Great Plains, J. B. Kincer (*Bul. Amer. Met. Soc., 16 (1935), No. 5, pp. 146–148*).—It is stated that "man cannot basically change his climate", but that he is not helpless to alleviate some of its unfavorable aspects. He "has contributed very materially to the damaging effects of the Great Plains drought, through extensive cultivation where it never should have been practiced. This has intensified the drifting of soil and contributed to severe dust storms, which were important unfavorable features of the recent drought. The remedy here is fewer cultivated fields; more natural vegetation; more grasslands without too close grazing; and any device that would diminish the surface velocity of the wind and conserve soil moisture."

The influence of rainfall on the yield of cotton, S. N. Venkataraman (*Assoc. Econ. Biol., Coimbatore, Proc., 1 (1930–33), pp. 3, 4*).—From a quantita-

tive study of the effect of the amount and distribution of rainfall, seasonally and through a period of 20 yr., on the yield of cotton at Coimbatore, Madras, India, the conclusion is drawn that "extra rain tended to reduce the yield in a greater part of the year and more particularly in the months of July–August, and this effect was more pronounced in cotton after cumbu (*P[ennisetum] typhoideum*) than in cotton after cholam (*A[ndropogon] sorghum*)."

Rainfall and hemlock growth in New Hampshire, C. J. LYON (*Jour. Forestry, 33 (1935), No. 2, pp. 162–168, figs. 3*).—This article presents graphically and otherwise results of an attempt to determine the value of tree rings obtained from a virgin forest of pine and hemlock in New Hampshire, and U. S. D. A. Weather Bureau records extending back to 1857, as an index of rainfall variations during the life of the trees. There was found to be a close relationship between growth increment and the water supplied during the growing seasons since 1857. This was found to be the case not only in years of low rainfall such as 1876, 1749, 1681–1682, and 1640, but in periods of retarded growth in both the seventeenth and eighteenth centuries, with less well defined periods in the nineteenth and twentieth centuries. With regard to temperature influence, the year 1816, known as the year without a summer, appears to have had no unusual effect on the growth of hemlock.

Duststorms in the Southwest, J. D. BOON (*Field and Lab., 3 (1935), No. 2, pp. 33–40, figs. 3*).—This article discusses briefly some characteristics of dust storms which have occurred recently in the Southwest part of the United States, their causes and behavior, and their effect on atmospheric conditions.

Meteorological tables, D. A. SEELEY and A. E. WHITE (*Mich. State Bd. Agr., Ann. Rpt. Sec., 73 (1934), pp. 153–166*).—Data corresponding to those previously noted (E. S. R., 71, p. 160) are reported for the year ended June 30, 1934.

SOILS—FERTILIZERS

[Soil work at the Arizona Station] (*Arizona Sta. Rpt. 1934, pp. 6, 7, 13–22, 91, figs. 2*).—The report discusses phosphate availability, soil alkalinity problems, nitrogen-fixing bacteria, soil moisture investigations, soil reaction, electrodialysis of soils, etc.

[Soil investigations of the Michigan Station], C. E. MILLAR (*Michigan Sta. Rpt. 1934, pp. 233–239*).—This work has included field experiments on fertilizer treatments of several soil types and crops, especially alfalfa and turf grasses; fertilization, liming, and green manuring; fluorine in superphosphates; nonsymbiotic nitrogen fixation in a number of the principal soil types of the State; and improvement of muck soils.

[Soil investigations of the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 48–50*).—Data are reported on muck soil management, the effect of fertilization and soil type on composition and yield of alfalfa, the placement of fertilizer for cultivated crops, the effect of superphosphate and hydrated lime on loss of nitrogen from manure during storage, methods for studying physical properties of soils, and nitrogen fixation in soils.

Soil fertility experiments [of the New Hampshire Station] (*New Hampshire Sta. Bul. 284 (1935), pp. 9–11*).—This work has included, as in previous years (E. S. R., 71, p. 463), hay and legumes on neglected hay lands at Greenland; dairy farm rotation on neglected hay lands at Pittsfield; potatoes in a 3-yr. rotation near Colebrook; and experiments on top-dressing old pastures, by F. S. Prince, P. T. Blood, T. G. Phillips, and G. P. Percival.

[Soil investigations of the Ohio Station] (*Ohio Sta. Bul. 548 (1935), pp. 17–20*).—This report notes experiments by R. Bradfield and [J. G.] Steele on the

fixation of phosphates by the clay colloids of certain soils, electrodialyzed and then exposed to phosphate solutions at various pH values; the movement of fertilizer salts in soils by capillarity, by G. M. McClure, dealing with the extent of the upward movement of phosphates and of nitrogen compounds as influenced by the nature of the compound itself, of other fertilizer salts present, and of the pH value of the soil; and factors affecting the value of soil as a source of inoculation for leguminous crops, by H. W. Batchelor.

Graphic comparison of the topography of orchard lands, J. O. Veatch and N. L. Partridge (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 98–101, figs. 2*).—The authors point out that any considerable natural division of land may be treated as consisting of the three topographic components, comparatively level upland, comparatively level lowland, and connecting slopes, and that the percentages of the land consisting of each of these components may be represented graphically by an upper and lower horizontal line representing, respectively, the higher and lower level components, while the proportion of the sloping land is represented by the proportional length of a sloping line connecting the other two parts, and the average gradient of the sloping land by the gradient of the sloping part of the graph line. For the lands specifically considered, four representative land types in Oakland County, the slopes were grouped into four classes of 5, 10, 15, and 30 percent average gradient, and, "the linear measurements for each slope class being known, all four could be integrated into a single line for the purpose of making a graph. The angle of inclination and the length of the line indicate, respectively, the relative steepness and the amount of sloping land in comparison with the amount of level land for each land type."

Simple and rapid methods for ascertaining the existing structural stability of soil aggregates, G. J. Bouyoucos (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 222–227*).—An investigation carried out at the Michigan Experiment Station has shown that potassium chloride has a marked effect in contracting the volume and decreasing the water-holding power of deflocculated soils. These phenomena were utilized in studying the structural stability of soil aggregates by measuring their settled volume and moisture equivalent after treatment with a normal solution of KCl.

"From the experimental results obtained, the soils examined group themselves into three classes in respect to their existing aggregate structural stability. Class 1 contains soils which reveal a stable existing aggregate structure. In these soils the KCl treatment produces no change in their settled volume and moisture equivalent, but they remain the same as with the water treatment. Class 2 comprises soils which reveal an unstable existing aggregate structure. In these soils the KCl treatment tends to reduce markedly both the settled volume and moisture equivalent. Class 3 represents soils which show only a moderately unstable existing aggregate structure. In these soils the KCl treatment reduces the volume and moisture equivalent to a varied but moderate degree.

"Both the settled volume and moisture equivalent always ran parallel and agreed with one another in every soil. This fact indicates that both of these methods give reliable results."

Colloid chemical aspects of clay pan formation in soil profiles, H. Jenny and G. D. Smith (*Soil Sci., 39 (1935), No. 5, pp. 377–389, figs. 7*).—For the study of clay pan formation the authors developed at the University of Missouri a method which permits quantitative measurements of clay accumulations in sand columns. In principle, a series of artificial soil skeletons, composed of quartz grains or spherical glass beads, was prepared, and clay suspensions

(sols) were passed through the beds. The effects of various treatments on the velocity of pan formation in these artificial systems were recorded quantitatively.

"Putnam clay, if sufficiently dispersed, will not form a heavy pan in beds of quartz sand or silt by mere sieve action. Electrolytes are responsible for the development of 'electrolyte pans' as a result of flocculation and retention of coarse clay aggregates. The higher the valency of the electrolyte cation the more rapid is the pan formation. Dehydration enhances clay accumulation, whereas colloidal humus favors translocation. Positive iron hydroxide sols give rise to 'attraction pans' based on adherence of iron hydroxide particles to the negative quartz grains and on mutual coagulation with negative clay colloids."

Principles of clay pan development in ideal soils are discussed.

Soil profile studies.—VII, The glei process, J. S. Joffe (*Soil Sci., 39 (1935), No. 5, pp. 391–401*).—The present installment of this serial contribution from the New Jersey Experiment Stations (E. S. R., 72, p. 162) is primarily a review and discussion of the work on glei formation, with reference mainly to the investigations of the Russian pedologists. The effect of oxygen in the ground waters on the process of gleiing and incidentally also on the state of the iron compounds is pointed out, and analyses of a glei podsol in New Jersey are presented and discussed.

"At the edge of the podsol zone, in the Northern Hemisphere, where the forest vegetation begins to dwindle more and more of the glei process is apparent, more and more is the marsh type the outstanding or prevailing type of soil formation. Thus the glei podsol in the northern countries testifies to the termination of the podsol process of soil formation and the inauguration of the northern marsh or tundra type of soil formation."

The infiltration capacity of soils in relation to the control of surface runoff and erosion, G. W. Musgrave (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 336–345, figs. 5*).—Pointing out that the amount of erosion occurring from a field for a rain of given intensity and duration may be approximately predetermined for a given set of conditions if quantitative data are available for (1) amount of water impounded upon the surface of the field by the treatment, (2) the rate of infiltration for the soil and conditions, and (3) the density of the run-off (pounds of soil per cubic foot of run-off) for the soil and the treatment, the author shows, from data obtained at the Iowa and Missouri erosion experiment stations of the U. S. D. A. Bureau of Chemistry and Soils, that the amount of water impounded by such treatments as terracing, contouring, etc., is approximately determinable, methods and specific cases of the measurement of the infiltration capacity of field soils being given.

"Before erosion control measures are designed and recommended for general application in the field, their probable effect should first be calculated and the degree of protection which they afford compared with the rainfall records of the area."

The determination of absorbed bases by boiling with ammonium chloride, and the utility of the procedure in related soil investigations, W. M. Shaw and W. H. MacIntire (*Soil Sci., 39 (1935), No. 5, pp. 359–375, fig. 1*).—Trials of the effect of boiling neutral normal ammonium chloride solution upon soils rich in carbonates and of high absorbed calcium and magnesium content are reported in a communication from the Tennessee Experiment Station, together with findings and conclusions stated, in part, as follows:

The ammonia liberations from soil suspensions in boiling neutral ammonium chloride were found to be caused not only by carbonates but also by absorbed

bases. They were found to be closely approximate to the joint values of the carbonates decomposed and the absorbed bases replaced, but the total of the dissolved bases could not be expressed as the absolute equivalence of the ammonia distilled from the ammonium chloride because of the variation shown by the soils in their specific capacities to retain NH_4 ions. Equivalence was attained, however, when the NH_4 held by the alcohol-washed and NH_4Cl-free soil was liberated by boiling with MgO and the ammonia so recovered was added to that obtained in the distillation with neutral normal ammonium chloride.

"It was found that boiling ammonium chloride effected complete disintegration of the several types of carbonate and complete replacement of absorbed and exchangeable bases. The method has the advantage of speed and requires only a small fraction of the ammonium chloride utilized by other methods. In effecting complete removal of bases, the ammonium chloride exerted only a nugatory solvent action upon the sesquioxides and silica in both humid and saline soils. Regardless of the initial reaction, pH 4–10, the final pH values of the digestions were within the pH range of 4.4 to 4.6."

Other experiments and determinative procedures are also detailed.

A comparison of glass and quinhydrone electrodes for determining the pH of some Iowa soils.—I, A comparison of different types of glass electrodes, H. L. Dean and R. H. Walker (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 429–436, figs. 3*).—In an investigation carried out at the Iowa Experiment Station the authors have made a study of the adaptability of the glass electrode for determining the H-ion concentration of soils.

A potentiometric set-up suitable for use with the glass electrode is described. This included a vacuum tube amplifying unit in combination with a Leeds and Northrup H-ion potentiometer and other commonly used instruments. Data which show that four different types of glass electrode gave similar results in the determination of the H-ion concentration of soils are presented. The variability in pH of replicate samples of soil was extremely small with each type of electrode.

A modified bulb, silver-silver chloride type of electrode was found most practicable and desirable because of its ease of construction, strength, durability, and maintenance. Several glass electrodes of the modified bulb type constructed from one stock of glass were found, in the main, to function similarly, and the data indicated that these electrodes may be expected to give accurate results.

Chemical studies of infertile soils derived from rocks high in magnesium and generally high in chromium and nickel, W. O. Robinson, G. Edgington, and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 471 (1935), pp. 29*).—The availability of nickel, chromium, and some of the other constituents was studied by means of the neutral ammonium acetate leaching method of Schollenberger and Dreibelbis (E. S. R., 64, p. 11). Nickel and chromium were, in some cases, determined in plants growing on the infertile soils.

"Whereas poor mechanical composition, causing poor internal drainage, an excess of magnesium, and lack of plant-food elements may be frequent causes of infertility in the soils studied, the only general and dominant cause of infertility in soils derived from ferromagnesian rocks is the comparatively high percentages of chromium and nickel." It is noted that two very different assumptions have been made to account for the infertility of soils derived from serpentine rock—(1) that the infertility is due to an excess of magnesia over lime and (2) that the main causes for the infertility of such soils are lack of plant-food elements and an alkaline H-ion concentration. "From the present study of the chemical composition of the soils and soil extracts, the writers

believe that the presence of comparatively large quantities of chromium and nickel, and perhaps cobalt, are the dominant causes of infertility in serpentine soils in which the physical conditions are favorable for plant growth."

Magnesium deficiency in Aroostook potato soils, J. A. Chucka (*Amer. Potato Jour., 11 (1934), No. 2, pp. 29–35; abs. in Maine Sta. Bul. 377 (1934), pp. 422, 423*).—This contribution from the Maine Station presents data obtained in experiments carried out during 2 yr. and on 10 farms on which magnesium sulfate, potassium magnesium sulfate, and dolomitic limestone were used as sources of magnesium, the magnesium compound being in each case added to the fertilizer.

It was found that "approximately 20 to 30 lb. of magnesium oxide per acre must be added to potato fertilizers to prevent magnesium deficiency in potatoes in Aroostook County. In fertilizers, soluble carriers of magnesium appear to be more effective than dolomitic limestone in preventing magnesium deficiency. Under Aroostook conditions the addition of high-calcium limestone to potato fertilizers results in a depression of the potato yields on most farms. Very material increases in potato yields may be obtained by the addition of magnesium as a top-dressing or in the form of a spray on fields showing severe magnesium-deficiency symptoms. It is suggested that the magnesium may be absorbed through the leaves by potato plants. Liming soils with dolomitic limestone is recommended as the most practical method of preventing magnesium deficiency."

Solubility of soil phosphorus as affected by moistening and drying basic soils, T. J. Dunnewald (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 325–329*).—The author of this contribution from the Wyoming Experiment Station observes that the previous treatment of the soil samples affected the availability of the phosphate as indicated both by a modification of the Denigès method (E. S. R., 44, p. 611) and by the growth of crop plants. Variations in the conditions of heat, light, moisture, and carbon dioxide concentration were accordingly studied with reference to their possible effects upon the solubility of the soil phosphates.

It was found that "certain arid and irrigated soils exhibited a reduction in solubility of their phosphorus when stored air dry in a closed dark space. The reduction was as high as 50 to 80 percent in some soils and was much lower in acid than in basic soils. The solubility was restored almost completely by moistening the stored soil with distilled water and allowing to dry overnight. The horizons containing the organic matter were most affected, and the high lime subsoils reacted differently. The phosphorus made soluble by cultivation and moistening of stored soils seemed to be available for plant growth in pots in the greenhouse.

"Hydroxyl ions are active in phosphorus replacement, and the results cited in this paper may possibly be explained on this basis."

Factors influencing phosphate fixation in soils, P. L. Hibbard (*Soil Sci., 39 (1935), No. 5, pp. 337–358, figs. 2*).—From a study of a number of recent papers, the author of this contribution from the University of California concludes that "fixation of phosphate in soil in order of decreasing importance is most influenced by pH, Ca^{++}, and ratio $\frac{SiO_2}{R_2O_3}$ in the soil colloids," and experiments leading to a simple method whereby the relative fixing power of soils may be estimated and given appropriate numerical representation are described.

"'Fixing power' is defined as the number of milligrams PO_4 per kilogram soil that must be added so that a 1:1 water extract will contain 1 p. p. m. PO_4." The influence of time, soil: water ratio, size and composition of soil particles, and

the effect of addition to the soil of H^+, Ca^{++}, Mg^{++}, K^+, Na^+, NH^+ soluble silica, and $CaCO_3$ were studied, and the results are discussed. Many other substances than soil were found to have the ability to fix soluble phosphate.

"Means for modifying fixation are: To increase fixation, raise pH, and add Ca^{++}, $CaCO_3$, and soil colloids; to decrease fixation, do the opposite, also add Na^+, NH_4^+, soluble silica, organic colloids, organic compounds of phosphorus, employ special methods of placement, and use pellets instead of fine particles of the phosphate fertilizer."

Phosphate availability in calcareous soils: A function of carbon dioxide and pH, W. T. McGeorge, T. F. Buehrer, and J. F. Breazeale (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 330–335, fig. 1*).—The authors report, as their conclusions from a series of experiments carried out at the Arizona Experiment Station, that "the problems of phosphate availability and phosphate fertilization in alkaline calcareous soils are largely dominated, if not completely governed, by three factors. First, solid-phase calcium carbonate, which is present in abundance, reduces the solubility of the phosphate in carbonato-apatite because of the combined common ion effect of Ca^{++} and CO_3^{--}. Second, free hydroxyl ions reduce the absorption of phosphate ions by plant roots. Third, free hydroxyl ions modify the normal step ionization of orthophosphate in such a manner that the H_2PO_4 ion, which is preferred if not demanded by plant roots, is largely absent from the system.

"Carbonic acid and pH are the key to the availability of phosphate in these soils, and our knowledge of the natural form of phosphate present in these soils, together with its properties, suggests that only water-soluble phosphates be used as fertilizer, and this has been demonstrated experimentally."

●**The relation of potential alkalinity to the availability of phosphate in calcareous soils**, W. T. McGeorge (*Soil Sci., 39 (1935), No. 6, pp. 443–452, figs. 5*).—Experiments carried out at the Arizona Experiment Station indicated that the alkaline calcareous soils considered present a phosphate nutrition problem resulting not only from the low solubility of the phosphate compounds naturally present but also from an interference by the alkaline reaction of the soil with the absorption by crops of added soluble phosphates. Further, "the alkalinity of irrigation waters, both of themselves and in association with the potentially alkaline zeolitic compounds in the soil, makes for further reduced phosphate absorption by crops.

"Reducing the pH of the irrigation water by addition of small amounts of sulfuric acid greatly increases the absorption of phosphate by plants irrigated with such water. It is not unreasonable to assume that the addition of acid to irrigation waters will become a standard practice in the not distant future on soils of these types."

A 25-year field comparison of high magnesium and high calcium limes, T. E. Odland and H. C. Knoblauch (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 216–221*).—In this research of the Rhode Island Experiment Station (E. S. R., 45, p. 817), high-calcium lime in both the hydrate and carbonate forms has been compared in field tests over a 25-yr. period with the same forms of a magnesian lime. The lime materials were applied at six different times during the experiment, and in quantities approximating the equivalent of 15 tons per acre of limestone. This treatment has brought the plats to a neutral reaction. Both general farm crops and market-garden crops have been included. Magnesium was supplied in the fertilizer in order to eliminate this nutritional factor as completely as possible.

Manganese deficiency became evident in a number of crops after the soil had reached a neutral reaction. As the different forms of lime were applied on

the basis of equal neutralizing value, there was no appreciable difference with respect to their effect upon the soil acidity as measured by the H-ion concentration. The average yields of all crops over the entire period calculated on a percentage basis were practically the same for the two forms of limestone and magnesium hydrate. The plat receiving calcium hydrate averaged about 8 percent less in yield over this period.

"From the data it may be concluded that these four forms of lime will give approximately equal results over a period of years when applied on a chemically equivalent basis if magnesium is not a factor from the nutritional standpoint."

Nitrification in the Grundy silt loam as influenced by liming, R. H. Walker and P. E. Brown (*Jour. Amer. Soc. Agron.*, *27* (*1935*), *No. 5, pp. 356–363, figs. 3*).—Plats of Grundy silt loam at the Iowa Experiment Station were treated with various quantities of quarry-run limestone, with limestones of different degrees of fineness, and with hydrated lime. The soil of these plats was sampled frequently over a period of 5 yr., and its nitrifying power was determined.

The limestones and hydrated lime exerted an appreciable effect on the pH and the nitrifying power of the soil. "The changes in nitrifying power appeared to be associated directly with the changes in H-ion concentration, these changes being, to a certain extent, a function of the amount of limestone, or of the degree of fineness of the limestone applied."

The data were analyzed statistically to ascertain the significance of the differences in nitrifying power of the variously treated soils. "This analysis shows that where limestone was applied in amounts less than the lime requirement of the soil or slightly above, the mean increases in nitrifying power induced by 1-ton additional applications of limestone were comparatively large and rather consistent, but they were not quite large enough to be significant. Two-ton increases in amounts of limestone applied induced such large increases in nitrifying power that they were significant or highly significant in each case. Where limestone was applied in amounts beyond the lime requirement of the soil, the increase in nitrifying power induced per unit of limestone was reduced somewhat, and larger additional amounts were found necessary to bring about significant increases in nitrifying power.

"The 5-yr. means of the nitrifying power of soils treated with equal amounts of quarry-run, 20-mesh, 40-mesh, and 100-mesh limestones were comparatively uniform, and all except that for the 40-mesh limestone were significantly lower than that for the hydrated lime. The mean difference in nitrifying power between the 40-mesh and hydrated lime-treated soils lacked only a very small amount of being significant statistically."

Studies on protein synthesis by the genus Azotobacter, R. A. Greene (*Soil Sci.*, *39* (*1935*), *No. 5, pp. 327–336*).—In an investigation into the nature of the nitrogen compounds produced in the fixation of atmospheric nitrogen by the genus *Azotobacter*, reported from the University of Arizona, four species of the genus were grown on nitrogen-free mannitol agar, and the bacterial growth was analyzed. *A. vinelandii* and *A. agilis* were found very similar in composition, and a close similarity between *A. chroococcum* and *A. beijerinckii* was indicated. This relationship showed itself also in their nitrogen-fixing abilities.

A Van Slyke distribution (E. S. R., 26, p. 22) did not reveal consistently wide differences but did indicate this similarity. Arginine and lysine were the amino acids found in largest percentages. Tyrosine, tryptophan, cystine, and histidine were found in smaller proportions. Approximately 40 percent of the total nitrogen was found in the nonbasic fraction, "which indicates the pres-

ence of simpler amino acids (glycine, alanine, etc.)." Qualitative tests showed the presence of a substance giving a positive reaction with sodium nitroprusside. It is suggested that this substance may be glutathione.

Semiquantitative determinations indicated that the proteins present were chiefly globulins, glutelins, and albumins.

Some limitations of plant juice analyses as indicators of the nutrient needs of plants, J. M. POEHLMAN (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 195–207, figs. 2*).—The experiments here reported from the University of Missouri failed to bring out any significant differences, through an analysis of variance, in the concentrations of nitrates, phosphorus, and potassium in the expressed plant juice of two varieties of soybeans. Moderate fertilizer treatments had no significant effect on these concentrations the first season. In the second season, when the fertilizer treatments were repeated, relations between the treatments and the phosphorus and potassium concentrations were found.

Soil type and climatic differences due to seasons are both believed to have been important factors in determining the concentrations of phosphorus and potassium in the plant juice. The variance due to season was larger than the variance due to soils. The phosphorus and potassium concentrations in the plant juice in succeeding seasons held the same relation between Oswego and Lebanon soils and were related to the concentration of these elements in the soil.

Correlations between the concentrations of phosphorus in the plant juice and the yields of hay and the concentrations of potassium in the plant juice and yields of seed were calculated. An analysis of variance and covariance applied to the data shows the correlation coefficients and the regression of yield on concentrations of phosphorus and potassium in the plant juice.

Five years' results with fertilizers on a demonstration farm in Tuscola County, R. L. COOK and C. E. MILLAR (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 116–130, figs. 3*).—Fertilizer experiments with various crops, rotations, and fertilizer mixtures are reported and are discussed on the basis of profit per dollar spent for fertilizer.

Fertilizer usage in Ohio from 1920 to 1934, R. M. SALTER (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 75–81*).—This is a compilation of fertilizer sales figures for the period named, the discussion of trends in the use of fertilizers being accompanied by tables of annual total tonnages of fertilizers sold in Ohio (bone meal and basic slag) and mixed fertilizers; comparative tonnages of straight phosphates (superphosphate, bone meal, and basic slag) and mixed fertilizers; actual tons of nitrogen, phosphoric acid, and potash applied each year in Ohio; average analysis of mixed fertilizers sold in Ohio; tonnages of different grades of superphosphates sold; tonnages of mixed fertilizer analyses occurring in the recommended "standard" list; tonnage trends for selected analyses; sale of "concentrated" or "double strength" standard ratio fertilizers; sales of unmixed nitrogen carriers and potash salts; and spring and fall sales of fertilizers in Ohio in 1934.

Registration, labeling, and inspection of commercial fertilizers, 1934, F. B. MUMFORD, L. D. HAIGH, and E. W. COWAN (*Missouri Sta. Bul. 348 (1935), pp. 36*).—This bulletin reports the fertilizer analysis data for 1934, adding a brief general statement concerning the reaction of the non-plant-food residue and its probable effect upon the reaction of the soil. The materials examined are considered not likely to bring about a serious increase in acidity of the soil when applied in the quantities commonly used.

Inspection of commercial fertilizers for 1934, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul. 283 (1934), pp. 18*).—The trend toward higher

plant food concentrations is shown in this report on 82 brands of complete fertilizer, of which the average total plant food content was 21.98 percent guaranteed, 22.59 percent found, although the present State law requires a minimum of only 14 percent. The analytical results of the 1934 inspection are given.

AGRICULTURAL BOTANY

The presence, distribution, and role of aluminum in plants, G. Levy (*La Présence, la répartition et le rôle de l'aluminium chez les végétaux. Thesis, Univ. Paris, 1931, pp. 98, figs. 3*).—The principal contributions on the qualitative and quantitative determination of Al in plants are cited and reviewed.

The method used by the author in her investigations is described. Incineration, elimination of Si, precipitation of the phosphates of Fe, Al, and Ca, the elimination of Ca, reduction of Fe, and precipitation of Al, calcination, and weighing are involved. Specimens were carefully selected and great care taken to remove all dust and dirt which otherwise would constitute a serious source of error. Over 75 specimens of plants belonging to 37 families, mostly phanerogams, were analyzed. The results are tabulated.

Al was found to be present in all the phanerogams investigated, accumulating more rapidly during early growth than later, more abundantly in the leaves than elsewhere, and more abundantly in the greenest leaves than in pale or etiolated ones. The seeds in general were low in Al in contrast to Fe and Zn. Fleshy, succulent fruits had usually a medium content of Al, as did bulbs and tubers, except in the case of the strawberry receptacle which was relatively very rich in Al as it was in Fe, Mn, Zn, and Ti. Edible roots had less Al than ordinary roots. The onion bulb was especially rich in Al as in other metals. Xerophytes were as rich in Al as hydrophytes. Al was found to be a constituent of vegetable matter about in the same quantity and sometimes above that of Fe. *Sterigmatocystis* [*Aspergillus*] *nigra* grew normally in the absence of Al. The latter had no apparent effect until it reached 350 mg per liter (as sulfate) of culture solution, when it clearly hindered growth.

Absorption of nitrates by corn in the dark, P. L. Gile (*Science, 81 (1935), No. 2108, pp. 520, 521*).—Corn plants were grown in nutrient solutions with 7 hr. of light and 17 hr. of darkness each day. Two check lots received uniform treatment in both light and dark. One was supplied with a complete nutrient solution in both periods and the other with a solution lacking only nitrate. The third lot received the nitrogen-free solution in the light and the complete solution in the dark, while the fourth lot received the complete solution in the light and the nitrogen-free solution in the dark. The plants were grown 12 days and analyzed. The plants had been grown 7 days prior to starting the experiment in a nitrogen-free solution to produce a nitrogen deficiency.

Plants receiving nitrate at any period during the test made a good growth and were normal in appearance. A table gives the data on growth and nitrogen assimilation. They show that corn grown under alternating periods of light and dark is capable of assimilating nitrate fully as well in darkness as in light. The author concludes that the effect of light on ion absorption is indirect, the direct effect of light being on carbohydrate synthesis or on changes in organic matter which in turn control ion absorption.

Factors affecting the absorption of selenium from soils by plants, A. M. Hurd-Karrer (*Jour. Agr. Res.* [*U. S.*], *50 (1935), No. 5, pp. 413–427, figs. 4*).—Plants were found in a series of greenhouse pot tests to accumulate relatively large quantities of selenium from sodium selenate in the soil. Representatives

of the Cruciferae absorbed the most, certain Gramineae the least, and, in general, the legumes were intermediate. Since the sulfur requirements of members of these three groups are, generally speaking, in this same order, it is suggested that the tendency of a crop to absorb selenium depends on its tendency to absorb sulfur.

In wheat grown on Pierre clay the quantity of selenium taken up ranged from 300 p. p. m. in apparently uninjured plants grown with 1 p. p. m. of selenium added to the soil as sodium selenate to 1,350 p. p. m. in plants fatally injured by the addition of 20 p. p. m. to the soil. In Keyport clay loam selenium was less available, hence a given concentration was less toxic, 20 p. p. m. producing but 530 p. p. m. in the tissues, which were quite chlorotic but not severely injured. Correspondingly less sulfur was required for control of the injury produced by a given selenium concentration in the Keyport clay loam than was required in the Pierre clay.

Applications of elemental sulfur reduced the selenium taken up by wheat plants from untreated naturally seleniferous soil from 450 to 15 p. p. m. Selenium added to soil as sodium selenate proved much more available and correspondingly more toxic than that added as sodium selenite, while elemental selenium was nontoxic and was not detected in the tissues. Sodium selenate was at least partly held in the upper layers of soil on which a solution containing it was poured. Penetrability and toxicity were increased by adding sand to the soil.

The diagnostic value of the chlorine content of the vine leaf, J. E. THOMAS (*Jour. Council Sci. and Indus. Res.* [*Aust.*], 7 (*1934*), *No. 1, pp. 29–38, figs. 2*).—An investigation was made of the relationship of the soil Cl content to the leaf Cl of salt-affected grapevines in an area where NaCl constitutes up to 70 percent of the total salts when salinity is injurious. The lesions due to excessive salinity are described. There was a close correlation between leaf and soil Cl. Variations between the Cl content of leaves of a single vine usually show an increase of Cl with the age of the leaf. Concentration of Cl beyond 0.5 to 0.6 percent of the dry matter of the leaf may be considered indicative of excessive soil salinity in those instances where the mixture of soil salts is similar.—(*Courtesy Biol. Abs.*)

The growth of *Agaricus campestris* on plots treated with sodium chlorate, G. M. SHEAR (*Phytopathology, 25* (*1935*), *No. 4, pp. 440–442*).—At the Virginia Experiment Station *A. campestris* was found growing prolificly in early August on plats where quackgrass had been treated 9 weeks before with sodium chlorate (1.5 lb. per gallon of water per 100 sq. ft.). Four to six times as many fruiting bodies were produced on treated as on nontreated plats.

Physiologic studies of germination in reference to the significance of the aleurone layer in *Oryza* and other Gramineae [trans. title], H. SCHANDER (*Ztschr. Bot., 27* (*1934*), *No. 9–10, pp. 433–515, figs. 30*).—In the hope of gaining information on the role of vitamins in the plant kingdom, tests were set up to determine the effects of removing some or all of the aleurone layer upon the germination of the kernels under sterile conditions and the subsequent growth in *Coix lacryma-jobi, Zea mays, Triticum sativum, Secale cereale, Hordeum vulgare, Avena sativa, Oryza sativa,* and *Stipa pennata.* The removal of areas of the aleurone layer from dry kernels checked germination and subsequent growth in proportion to the amount of aleurone layer removed, provided the connection between the aleurone layer and scutellum was not broken. The breaking of this connection, however, resulted in as much checking of growth as the removal of the entire aleurone layer.

In the various species the effect on germination and subsequent growth following the removal of the aleurone layer varied according to the ratio of the size of the embryo to the size of the kernels. The removal of the aleurone layer affected the species in a descending degree as follows: *Stipa*, *Oryza*, *Avena*, group Hordeae, *Zea*, and *Coix*.

Movement of growth substances in the periphery of the kernels was demonstrated. In rice the movement of the growth substances in the kernel was in the ribs or veins of the pericarp, the movement being basal-apical in the keel rib on the ventral side of the kernel and apical-basal in the lateral and dorsal ribs. The breaking of the continuity of the lateral and dorsal ribs by a partial ringing of the kernel near its base checked growth as much as complete ringing or the removal of the entire aleurone layer—severing the ventral rib had but little effect upon germination and subsequent growth.

The conclusion was that the endosperm, presumably the aleurone layer, furnishes an activating growth substance that passes during the swelling stage of germination to the embryo, which is thereby enabled to provide the endosperm with the starch-digesting enzymes. That the transference of the growth substances occurred during the swelling stage of the kernel was shown by the fact that the disjunction of the aleurone layer and scutellum after the kernels had undergone 6 or more hours' swelling had but little effect on germination and subsequent growth, whereas disjunction of the aleurone layer and embryo in dry seeds affected germination and subsequent growth as much as the removal of the entire aleurone layer. The endosperm and embryo, if separated after the kernels had swollen, were able to continue the germinative processes independently. The growth substances were not identified, but evidently differ from auxin.—(*Courtesy Biol. Abs.*)

The resistance porometer and its application to the study of stomatal movement, F. G. Gregory and H. L. Pearse (*Roy. Soc.* [*London*], *Proc.*, *Ser. B*, *114* (*1934*), *No. B 790*, *pp. 477–493*, *pl. 1*, *figs. 9*).—The resistance porometer, devised in connection with this work, measures changes in stomatal resistance to flow by drawing an air stream through the stomata into a porometer cup, thence through a variable capillary resistance to a constant-pressure aspirator. A manometer is inserted between the porometer cup and the capillary resistance, and change in stomatal resistance is measured by change in level of the manometer. The instrument is described in detail and the theory of its action discussed. The stomatal resistance can be calculated in capillary units of resistance. A modification for automatic recording is described.

Results showing some known stomatal effects are presented, as well as a continuous automatic record of stomatal movement over 7 days in alternating periods of 8 hr. of light and of darkness.

This porometer is particularly sensitive to change in aperture when the stomata are wide open—practically instantaneous readings can then be made.—(*Courtesy Biol. Abs.*)

Induced morphological, physiological, and chemical variations following seed-exposure to X-radiation in Nicotiana tabacum, B. N. Singh and R. S. Choudhri (*Indian Acad. Sci. Proc.*, *1* (*1935*), *No. 8*, *pp. 435–451*, *pls. 3*, *figs. 4*).—Pure-strain seeds of tobacco, as uniform in size and weight as possible, were subjected for 1 min. only to X-rays with wave length ranging from Kα 1.5 to Kβ 1.2 a. u. at 20 cm distance from the window of a Shearer's tube with copper target operated at 37.5 kv and 4 ma. The window was covered with a filter of aluminum foil 0.025 mm thick. Some of the seeds were irradiated immediately before planting, and some 10 days before planting, being kept meanwhile

in an insulated lead basin. The treated and untreated seeds were sown in pots containing uniform soil-manure mixture and grown under identical conditions.

Exposure to these minute doses apparently resulted in greatly elongated plant height, more extensive root system, larger, greener leaves, better developed xylem bundles, shortened vegetative period, increased assimilation rate, larger flowers, larger yield of heavier seeds, and increased C/N ratio as compared with the checks. Plants from seeds sown 10 days after irradiation exhibited effects similar to those shown by seeds planted at once, except for a difference in degree. The results suggested acceleration of general metabolic activity by the X-rays.

[Studies of hardiness], S. Dunn (*New Hampshire Sta. Bul. 284 (1935), pp. 13, 14*).—A brief account is given of studies on the effect of temperature, mineral nutrition, and selection on hardiness and the extent to which the changes induced were measurable by the dye adsorption test with cabbage, potato, *Bryophyllum*, and Jerusalem-artichoke.

Physiological research on self-incompatibility in Petunia violacea, S. Yasuda (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 20 (1934), pp. 95, figs. 11*).—In an extensive series of experiments with *P. violacea* the author found convincing evidence in the pistils of self-incompatible individuals of special substances which inhibit self-fertilization by preventing normal pollen-tube development, although the pollen may be normal and functional when applied to other individuals of the same species.

These substances inhibiting to self-fertilization proved capable of accelerating cross-fertilization. They were apparently produced in the ovary, principally in placental tissue, but not in effective amount until about 1 day after the opening of the flower. From the ovary they ascended to the upper portion of the pistil, the rate depending on environmental conditions and genetic factors.

The inhibiting substances appeared to be water-soluble, diffusible through gelatin, and remained active in the dry powdered pistils or in the dried residue of the water extract. Self-fertilization was possible in some self-incompatible plants if pollinated before the flowers opened, i. e., before the inhibiting substances had been produced. By using this method it was possible to obtain pure line seeds of some self-incompatible plants.

The older flowers usually tended to lose fertility whether self- or cross-pollinated. Depression of vegetative growth and old age in some self-incompatible plants resulted in a decrease in the activity or amount of these special substances and brought a tendency towards self-compatibility. Self-fertilizing ability was increased also when plants were cultivated under low temperature conditions resulting in lowered production or lowered effectiveness of the special inhibiting substances.

The use of the quinhydrone and antimony electrodes for determining the pH of solid culture media, P. E. Tilford (*Phytopathology, 25 (1935), No. 3, pp. 362–367*).—The quinhydrone electrode was used at the Ohio Experiment Station for quick and accurate determination of the pH of agar culture media, such as nutrient, corn meal, lima bean, bean pod, prune, and potato dextrose, by mixing quinhydrone with a small sample of the medium and then taking the voltage reading in the usual manner not later than 1 min. after immersing the electrode. Readings made by this method on solid media checked well with colorimetric readings from pH 2 to 7.1—above pH 7.1 they were slightly too low. Most of the media, when diluted enough to remain liquid, showed appreciable change in pH. The antimony electrode was not as dependable as the quinhydrone.—(*Courtesy Biol. Abs.*)

GENETICS

The analysis of variance and the correlations between relatives with respect to deviations from an optimum, S. WRIGHT (*Jour. Genet., 30 (1935), No. 2, pp. 243–256*).—Formulae are theoretically calculated for the mean and variance of squared deviations from an optimum for cases of no dominance and complete dominance with and without environmental complications. The variance is analyzed into causative factors. Formulae are derived for the parent-offspring and for fraternal correlations.

Evolution in populations in approximate equilibrium, S. WRIGHT (*Jour. Genet., 30 (1935), No. 2, pp. 257–266*).—This is a theoretical study of the evolutionary process in populations, in which the selective values of different grades of a character depend on their squared deviation from an optimum in cases of additive genes with and without dominance, in continuation of the above paper.

The location of a gene for disease resistance in maize, V. H. RHOADES (*Natl. Acad. Sci. Proc., 21 (1935), No. 5, pp. 243–246, fig. 1*).—Cytological studies of X-ray induced deficiencies and genetical studies of trisomic ratios made at Cornell University indicated that the factor for resistance to physiologic form 3 of *Puccinia sorghi* is located in the short arm of the tenth and shortest chromosome of the haploid corn complement.

A case of chlorophyll deficiency in rice, L. E. W. CODD (*Jour. Heredity, 26 (1935), No. 2, pp. 85–87, fig. 1*).—The chlorophyll deficiency observed at the Georgetown, British Guiana, Experiment Station involved three factors which in the homozygous recessive condition produced white seedlings. Demerara Creole probably possesses two of these factors, while the third is contributed by Mexican Edith, Americano 1600, and Blue Rose.

An interspecific hybrid in Allium, S. L. EMSWELLER and H. A. JONES (*Hilgardia [California Sta.], 9 (1935), No. 5, pp. 265–273, figs. 4*).—Successful crosses were made between Nebuka, a nonbulbing perennial variety of *A. fistulosum*, and several varieties of *A. cepa*, such as Yellow Globe Danvers, Australian Brown, White Persian, and California Early Red. In all cases the hybrids were slightly bulbing and perennial. The hybrid Yellow Danvers × Nebuka bloomed a month later than Nebuka and showed considerable resistance to pink root. In flowering habit this hybrid was intermediate between the parents. Although all the hybrids which have bloomed so far have been practically self-sterile, it was possible to make back-crosses using the hybrids as pollen parents.

Meiosis in Allium fistulosum, Allium cepa, and their hybrid, S. L. EMSWELLER and H. A. JONES (*Hilgardia [California Sta.], 9 (1935), No. 5, pp. 275–288, pls. 6, figs. 3*).—Experiments to determine the underlying causes of sterility in the hybrid *A. cepa* × *A. fistulosum* are discussed. Pollen mother cells of the parental species and of the hybrids were examined cytologically, and it was found that meiosis in *A. cepa* paralleled that in *A. fistulosum* in all stages, except that at the metaphase the chiasmata were not localized in the constriction region. In the hybrid, abnormalities, such as pairing of chromosomes of unequal length, were observed at late pachytene and diplotene. A method for securing chromosome index number by determining the ratio of the short to the long arm individuals is presented and affords evidence that the location of the insertion region is constant. Separation of paired chromosomes at anaphase apparently depended in part on the operation of some external force that pulled out the chromosome matrix at the insertion region. The chiasmata of the hybrid were very similar to those of *A. cepa*. Bivalents formed by chromosomes of different

lengths were occasionally observed in the hybrid, and in the first anaphase they occasionally separate with a long plus short chromatid associated.

Complementary investigations on the markings of horses and their inheritance [trans. title], H. MUNCKEL (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 30 (1934), No. 1, pp. 65–114*).—A study of the inheritance of white markings on about 4,000 horses showed that white markings were dominant to their absence. Expressions of markings of different types and shapes in connection with various colors are described in detail.

The results of investigations of the appearance and behavior of albinos in Brown Swiss cattle [trans. title], P. CARSTENS, A. MEHNER, and J. PRÜFER (*Züchtungskunde, 9 (1934), No. 11, pp. 399–411, figs. 8*).—By mating an albino male and female, an albino calf was produced. All the albinos showed definite photophobia, and histological study of the hair and iris showed them to be pigmentless.

A series of color shades ranging from dark brown to albino was found to exist in this breed, which is suggested as being controlled by a multiple allelomorphic series.

Regular phenomena in the appearance of albinism in domestic cattle [trans. title], A. OSTERMAYER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 30 (1934), No. 2, pp. 255–267*).—Data are presented on the amounts and location of white markings on Sudetic cattle.

The meaning of the inheritance of a tuberculosis susceptibility in cattle [trans. title], C. EHRLICH (*Züchtungskunde, 10 (1935), No. 1, pp. 1–10*).—The occurrence of many cases of tuberculosis in families of cattle suggests a hereditary basis for susceptibility to the disease.

Observations on the meaning of the balancing of the pigs in a litter and the inheritance of this property [trans. title], H. LÜTHGE (*Züchtungskunde, 8 (1933), No. 9, pp. 333–344*).—Observations made on 4,331 Improved Landschwein and Berkshire pigs born from 1922 to 1933 showed differences in the litters born in various families. There were tendencies in some families for the individuals within a litter to be relatively uniform in weight, whereas in other families much greater variation was shown. It is considered that this tendency is hereditary.

Information on the alternative modifiability of the hair color of Russian rabbits: A contribution to the theory of the quantitative influence of the gene [trans. title], W. ENGELSMEIER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 68 (1935), No. 3–4, pp. 361–416, figs. 16*).—Accurate measurements of the skin temperature on different parts of the body of black, wild color, brown, and blue Russian rabbits showed that the temperatures of the extremities were sufficiently lower on these parts to account for the darker hair color. Similar reduction in the temperatures of other areas during hair growth resulted in pigmented hair. The critical temperature for such changes was 2.6° C. higher in homozygous than in heterozygous Russian rabbits. A longer duration of the lowered temperature was required to bring in pigmented hair on the belly than on the back.

Physiological study of some cases of heredity in poultry [trans. title], F. CARIDROIT and V. RÉGNIER (*Terre et Vie, 4 (1934), No. 12, pp. 643–653, figs. 8*).—Data are reported on the characteristics of the progeny of crosses between Rhode Island Red males and Blue Andalusian females, the back-cross of the progeny with a Blue Andalusian male, the relationship of the gonads to the expression of the various plumage characters, and the cross of a Brown Leghorn male with a White Spotted Andalusian female.

Studies on the creeper fowl.—VII, The expression of vitamin D deficiency (rickets) in creeper chicks as compared with normal chicks, W. Landauer (*Amer. Jour. Anat., 55 (1934), No. 2, pp. 229–252, figs. 10*).—This paper continues the series (E. S. R., 71, p. 615). Creeper and normal chicks were placed on vitamin D-deficient rations in two experiments. In both experiments larger numbers of creeper chicks showed symptoms of rickets earlier than the normals and the rachitic symptoms were more pronounced in the creeper fowl. Histological study of the bones showed that the creepers were less able to compensate for the failure to form dense bone by excess thickening than was observed in the normal fowl.

Studies on the creeper fowl.—VIII, The effect of bone extract on skeletal growth and the phosphatase content of the bones, W. Landauer, E. Upham, and F. Rubin (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 121–126*).—Aqueous bone extracts injected during the first 8 weeks of life did not have any effect on bone growth of normal or creeper chicks, and phosphatase activity per unit of weight appeared to be the same in normals and creepers.

Studies on the creeper fowl.—IX, Malformations occurring in the creeper stock, W. Landauer (*Jour. Genet., 30 (1935), No. 2, pp. 303–319, pls. 3*).—Descriptions of 14 malformed embryos showing similar characteristics and produced in very small numbers in creeper stocks are given. In all birds there were defects in one or several extremities, and in all but two cases defective development of the caudal part of the vertebral column was apparent.

From the breeding data it appears that the malformations cannot be due to the creeper mutation, to a recessive gene linked with it, or to nongenetic agencies acting on the eggs of creeper hens. The cause is suggested as being due to irregularities of crossing over resulting from the supposed sectional deficiency in the chromosome of creepers. A partial suppression of crossing over may be another factor in causing the low incidence of the abnormality.

Autosomal colour mosaics in the budgerigar, F. A. E. Crew and R. Lamy (*Jour. Genet., 30 (1935), No. 2, pp. 233–241, pl. 1, fig. 1*).—A description of 17 color mosaics in the budgerigar is given. All of these cases were explained by the elimination of the blue chromosome or gene for blue, resulting in the mosaic pattern which was on an entire side in 16 of the 17 mosaics. There are from 50 to 60 chromosomes in this species, with a single X chromosome in the female.

Placental anastomosis of horse twins of different sexes [trans. title], **K. Keller** (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 30 (1934), No. 2, pp. 241–253, figs. 6*).—Two fetuses of different sexes, in which anastomosis of the placentae were studied, are described. The male was somewhat better developed and showed a more muscular neck and more bone than the female. These are considered to be normal, and suggest the lack of a detrimental influence of the sex hormones of one fetus on the development of the other.

Absence of light and the reproductive cycle in the guinea pig, E. W. Dempsey, H. I. Myers, W. C. Young, and D. B. Jennison (*Amer. Jour. Physiol., 109 (1934) No. 2, pp. 307–311, fig. 1*).—Observations of the occurrence of estrum in 30 guinea pigs confined in a completely darkened room showed that they were as likely to come in heat at one time of the day as another, whereas under normal conditions the guinea pig usually comes in heat at night. The duration of the estrous period and the recurrence of estrum in animals confined in the dark were normal.

Biological methods of diagnosing equine pregnancy, I, II (*Roy. Soc. [London], Proc., Ser. B, 116 (1934), No. 798, pp. 237–247, fig. 1; 247–258, pls. 2*).—Two papers are given.

I. *The mouse test*, W. C. Miller.—A biological method for diagnosing pregnancy in the mare, based on the presence of the estrum-producing hormone in the urine, is reported. The estrin content of the urine is determined by the production of cornified cells in the vaginal smear of ovariectomized females after six injections at one-half day intervals with varying amounts of the pregnancy urine in different animals. A total of 1,303 mares have been tested and a check of the results obtained in 983 cases. More than 99 percent accuracy was obtained in the tests when repeated in certain cases because of their having been conducted early in the gestation period. Some pregnancies were determined as early as the forty-second day of gestation. Positive indications were generally obtained by the sixtieth day of gestation.

II. *The capon test*, A. W. Greenwood and J. S. S. Blyth.—A pregnancy test for mares, based on the production of red pigment in the feathers of Brown Leghorn capons on injection of urine from pregnant animals, was found to give results in complete agreement with those noted above

The feather changes could be determined within 48 hr. after the first injections were made in the capons by having the feathers plucked and in the proper stage of development.

Results were obtained with 19 mares and were based on the estrin content of the urine.

The hormonal determination of pregnancy in the mare [trans. title], [D.] Küst (*Züchtungskunde, 8 (1933), No. 10, pp. 369–374*).—A discussion of the application and use of the tests for the presence of the gonadotropic and follicular hormones in the blood and urine of the mare during pregnancy.

The gonad-stimulating hormone of pregnant mares, H. R. Catchpole and W. R. Lyons (*Amer. Jour. Anat., 55 (1934), No. 2, pp. 167–227, pls. 4*).—A more complete account is given of the results of studies, at the University of California, of the gonad-stimulating hormone present in the blood, chorion, endometrium, hypophysis, allanto-chorionic fluid, fetus, and fetal hypophysis of from 60 to 70 mares at various stages of pregnancy than was previously presented by Catchpole and Cole (E. S. R., 72, p. 314).

The results showed that gonad-stimulating hormone usually appears in the blood when the crown-rump length of the fetus is from 1.9 to 2.5 cm. Biological assays of the extracts of the other organs indicated that the hormone appears in these organs at about the same time its appearance in the blood stream can be detected. Detection of the hormone of the hypothesis in the mare was possible at a relatively early age. No hormone was detected in the allanto-chorionic fluid, in extracts of the fetus, or in the fetal hypophysis except in rare cases.

The source of oestrin in the pregnant mare, G. H. Hart and H. H. Cole (*Amer. Jour. Physiol., 109 (1934), No. 2, pp. 320–323, fig. 1*).—The source of estrin in the urine of the pregnant mare was investigated in studies at the University of California. A mare was ovariectomized at about the two hundredth day of gestation. The estrin content of the urine dropped following the operation, but subsequently increased.

From this and other evidence it appears that the estrin of the urine of pregnant mares originates in the fetal placenta.

Oestrin and progestin content of the corpus luteum of the sow, C. A. Elden (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 515, 516*).—Determination of the rabbit units of progestin and rat units of estrin showed that the largest amounts of progestin were present in the early corpora lutea up to the sixth or seventh day after ovulation. Relatively large amounts of progestin were also present in the fully formed corpora lutea characteristic of early and

middle pregnancy, but at later stages the amount of progestin was materially reduced. The largest amounts of estrin were present in the corpora lutea of early and middle pregnancy and during the degeneration period.

The relation of the anterior lobe of the pituitary to ovulation in the rabbit, C. W. Bellerby (*Quart. Jour. Expt. Physiol., 24 (1934), No. 2, pp. 123–132*).—Intravenous injections of an extract of the anterior lobe of ox pituitary into 18 does caused ovulation in from 10 to 14 hr. in 14 cases. Such does also showed the nesting instinct and mammary gland development associated with pseudopregnancy. Ovulation occurred at about 11 to 12 hr. after administration of the anterior-pituitary extract to hypophysectomized does.

The effect of gonadotropic hormones during gestation and lactation, H. Selye, J. B. Collip, and D. L. Thomson (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 530–534*).—The administration of the anterior pituitary-like hormone to pregnant female rats caused the formation of very large corpora lutea. In lactating animals the preparation from pregnancy urine led to thecal luteinization as contrasted with the effects of pituitary preparations, which did not lead to luteinization.

Experiments on the gonadotropic complex of the anterior lobe of the hypophysis, A. Lipschütz (*Quart. Jour. Expt. Physiol., 24 (1934), No. 2, pp. 133–147, pl. 1*).—The prehypophysis of the adult female rat or guinea pig, which on intravenous injection into the infantile rat causes estrum but no ovarian change, was found, in several experiments, when combined with the urine of menopause which had estrogenic action but not a luteinizing action to produce typical luteinization in the immature ovary. It is thus considered that more than one hormone is involved. The estrogenic gonadotropic factor is present in the prehypophysis, whereas there is present in the menopause urine a gonadotropic hormone acting after the estrogenic hormone which causes luteinization.

Extraction of gonad stimulating substances of anterior lobe of the hypophysis, A. E. Meyer and H. L. Fevold (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, pp. 570, 571*).—Extraction of the gonad-stimulating substance of the anterior lobe of the hypophysis with a 50 percent aqueous pyridine solution is compared with extraction with a 6 percent aqueous butanol solution. The butanol extract was slightly more active. A 3 percent amyl alcohol solution had approximately the same potency as the butanol extract.

Effect of oestrin and gonadotropic hormone injections upon hypophysis of the adult rat, W. O. Nelson (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 452–454*).—Continued injections of estrin and gonad-stimulating hormones into normal and castrated male and female rats caused a decline in the number of basophiles in the hypophyses and the disappearance of the castration cells in the castrated animals. More hormone was required to produce the same change in males than in females.

Loss of sensitivity to the gonadotropic hormone of the hypophysis, H. Selye, J. B. Collip, and D. L. Thomson (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 5, p. 566*).—Eight female rats which had received daily implantations of rat hypophyses for 68 days were treated with 250 units of the anterior pituitary for 13 days. The ovaries of these animals were found to be greatly enlarged, indicating that the lack of sensitivity to the hypophyseal gonadotropic hormone did not prevent the rats from responding to the administration of the anterior pituitary-like hormone of pregnancy urine. This is considered to furnish additional evidence that these two gonad-stimulating substances are not identical.

Changes in hypophysis of adult male and female rats after pregnancy urine extract injections, A. E. Severinghaus (*Soc. Expt. Biol. and Med. Proc.,*

31 (1934), No. 5, pp. 593, 594).—Studies are reported on the cytological picture of pituitaries of normal and castrated male and female mice, some of which were injected with pregnancy-urine extracts. The results indicated that the pregnancy-urine extract seemed to cause an increase in the basophiles and a rapid atypical degranulation of their cytoplasm.

Further study of the size of the pars anterior and pars intermedia indicated that enlargement of the latter results from injections of Antuitrin S.

Reaction of anterior pituitaries of immature and mature female rats to injection of pregnancy urine extracts, J. M. Wolfe (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 7, pp. 812–814*).—Studies of the influence of injections of pregnancy-urine extract into immature and mature female rats showed that these injections produced marked changes in the basophiles and eosinophiles if the ovaries were present. The granular cells also became depleted of granules.

The physiology of pregnancy in the rat. Further data bearing on the prolongation of pregnancy, with a study of the effects of oöphorectomy during pregnancy, A. M. Hain (*Quart. Jour. Expt. Physiol., 24 (1934), No. 2, pp. 101–116*).—Studies of the influence of ovariectomy and injections of anterior-pituitary hormone on parturition are reported. Pregnancy persisted until the twentieth or twenty-first day of gestation following ovariectomy on the sixteenth or seventeenth day of gestation.

Ovariectomy at term delayed parturition, and only a portion of the litters were born alive. Injections of an alkaline extract of anterior pituitary, which delayed parturition in normal females from 5 to 7 days, caused a lesser delay in females which were ovariectomized during gestation.

The administration of an extract of anterior pituitary rich in growth hormone (phyone) and having only a slight ovarian reaction also prolonged the gestation period.

"Since parturition is protracted after removal of the ovaries and is completely prevented in absence of the anterior pituitary, it seems probable that ovarian-hypophyseal action is essential to the rapid expulsion of the fetus and to ensure live births; at the same time the existence of another factor in the birth mechanism is strongly indicated."

Effect upon lactation of oöphorectomy during pregnancy. (Albino rat.), A. M. Hain (*Quart. Jour. Expt. Physiol., 24 (1934), No. 2, pp. 117–121*).—Studies of the influence of ovariectomy on lactation in 12 rats showed that removal of the ovaries during gestation reduced or prevented lactation. Anterior-pituitary extract failed to promote lactation.

Anti-gonadotropic substances, C. Bachman, J. B. Collip, and H. Selye (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 544–547*).—Continued administration of gonadotropic extracts from the pituitary and from pregnancy urine to rats and rabbits caused the production of substances inhibitory to the action of these hormones. A passive resistance to these hormones was produced in infantile test animals by the administration of serum from animals chronically injected with the gonadotropic substances.

Response of adult rat testes sex accessories and adrenals to injections of prolactin, O. Riddle, E. L. Lahr, R. W. Bates, and C. S. Moran (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 3, pp. 509–512*).—Repeated doses of prolactin did not influence the size of the testes of adult rats but decreased the size of Cowper's gland and increased the size of the adrenals. The follicular-stimulating hormone and prolan were found to have no effect on the testes, but prolan caused marked enlargement of the seminal vesicles and prostate.

Studies on experimental lactation in the rabbit, J. K. Donahue (*Physiol. Zool., 7 (1934), No. 4, pp. 479–492*).—From the results of six series of experi-

ments at Princeton University dealing with the reaction of rabbits in different sexual conditions to the subcutaneous administration of extracts of the anterior pituitary containing the lactation hormone, it was found that the intact, multiparous female was more suitable for the bio-assay of this hormone than the nulliparous females, pregnant females, or immature males and females.

Further experiments indicated that pregnancy urine and pregnancy-urine extracts were lacking in the lactation hormone. The relation of the corpora lutea to the control of lactation is discussed.

The influence of prolan on lactation; experiments with cattle and sheep [trans. title], W. KOCH (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 30 (1934), No. 1, pp. 115–128*).—The administration of prolan to 22 cows and 25 ewes was found to stimulate growth and development of the mammary gland during puberty and pregnancy, but had no effect on the lactating animal. In the cow the negative result was independent of the normal production, stage of lactation, pregnancy, and estrous cycle.

Hypophysectomy of birds.—III, Effect on gonads, accessory organs, and head furnishings, R. T. HILL and A. S. PARKES (*Roy. Soc. [London], Proc., Ser. B, 116 (1934), No. 798, pp. 221–236, pls. 4, figs. 5*).—Hypophysectomy of fowls at the National Institute for Medical Research, London, was found to result in a rapid reduction in reproductive ability and a reduction in size and function of the testicles and ovaries and comb and wattles in males and females. The moulting season, loss of fertility, comb regression, loss of body weight, and such characteristics are considered to be associated with a temporary pituitary deficiency.

FIELD CROPS

[Field crops research in Arizona] (*Arizona Sta. Rpt. 1934, pp. 8, 32–41, 73–77, 85, 86*).—Reports are given on the progress of agronomic experiments (E. S. R., 70, p. 761) at the station and substations, including variety tests with corn, wheat, grain sorghum, cotton, alfalfa, and summer legumes; inheritance studies with alfalfa and wheat; time-of-cutting tests and methods of curing and baling alfalfa; study of differences in drought resistance in Baart and Hope and in other spring wheat varieties; growing wheat, corn, and beans after fallow; control of locoweed and other weeds with arsenic-sulfuric acid spray; and cotton research including breeding work, studies of the effects of soil moisture supply on lint yields and length and their interrelation with osmotic pressure and dry matter in cell sap and boll shedding, and cultural and irrigation tests. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Investigations with rice and other crops in Louisiana, 1932–34], J. M. JENKINS (*Louisiana Sta., Rice Sta. Bien. Rpt. 1933–34, pp. 6–18, 20–22*).—Continued research with rice (E. S. R., 67, p. 239) in 1932, 1933, and 1934 at the Rice Experiment Station, Crowley, included variety, date of seeding, date and manner of submergence, and artificial manure tests, and rice rotations. A special article, Improving Rice Varieties, by N. E. Jodon (pp. 15–18), describes the merits of certain varieties, importations, and hybrid selections, results of artificial crossing, natural crossing, and inheritance studies. A contribution by M. B. Sturgis, Controlled Experiments on the Improvement of Rice Soils (pp. 20–22), reports progress in efforts to improve rice yields by adding organic matter and fertilizers with and without intermittent drainage, and the value of organic matter with sulfur, limestone, or gypsum in improving the physical condition of the soil. Experiments with other crops included

variety trials with cotton, corn, and soybeans; fertilizer tests including potash needs and phosphorus sources with cotton; seeding tests with grain sorghum and sorgo varieties and corn; and pasture experiments on the effects of fertilizers and lime, and the merits of seeds mixtures and Italian ryegrass.

[**Fertilizer studies by the Fruit and Truck Station**] (*Louisiana Sta., Fruit and Truck Sta. Rpt.* [*1934*], *pp. 10, 11, 16*).—Results of tests with potatoes and corn, by B. Szymoniak, and with pasture improvement, by R. H. Lush, are noted.

[**Field crops experiments in Maine**] (*Maine Sta. Bul. 377* (*1934*), *pp. 326, 327, 334–340, 341, 342, 356–360, 395, 396, fig. 1*).—Experiments at Aroostook Farm with potatoes on which progress is reported included comparison of formulas and acre rates of fertilizers, green manures, and manures, magnesium deficiency studies, and several projects in cooperation with the U. S. Department of Agriculture embracing a comparison of complete fertilizers varying in potassium content and with and without added magnesium, tests of uncommon elements and acid-neutral fertilizers, and fertilizer placement studies, all by J. A. Chucka and D. B. Lovejoy; comparison of different spray schedules and of two v. three nozzles per row in spraying, spraying and dusting tests, distribution of new seedling varieties, yield comparisons between Green Mountain, Giant Hill, and Rust Proof, and reduction in stand by seed piece rot, all by R. Bonde; comparison of Green Mountain potato tuber lines, by D. Folsom; and tests of cooking quality of variously fertilized Green Mountain potatoes, by M. D. Sweetman. Cultural practices in relation to yield of potatoes per acre are discussed briefly. Results of variety tests with old-fashioned yellow-eye, red kidney, and pea bean types of field beans, by R. M. Bailey and I. M. Burgess, and fertilizer and liming tests with beans, by Chucka, Bailey, and Lovejoy are also included.

[**Field crops work in Michigan**] (*Michigan Sta.* [*Bien.*] *Rpt. 1933–34, pp. 18, 20, 32, 33, 50*).—Brief accounts of research not noted earlier report on the effects of date of planting on yield and growth of corn; a comparison of Maize Amargo and Duncan corn; analyses of sugar beet samples in 1932 and 1933 for sugar and purity; tests of methods for evaluating Michigan wheat for flour and determination of the moisture and protein contents of wheat of the 1932 and 1933 crops; curing tests, by R. H. Morrish and H. C. Rather, and fall clipping tests, by Rather, both with alfalfa; the time of plowing under sweetclover for beans, by H. R. Pettigrove; and the management of turf and lawn grasses.

[**Report of field crops work in Michigan**] (*Michigan Sta. Rpt. 1934, pp. 202, 222–224*).—Activities reviewed briefly include a study of the resistance of Maize Amargo and other corns to European corn borer; breeding work with corn, oats, field beans, and potatoes; pasture experiments, including trials of lespedeza varieties; curing tests with alfalfa and comparison of Grimm and Hardigan alfalfa from different localities; cultural and fertilizer tests with sugar beets and analysis of samples for sucrose and purity; and determination of moisture and protein in the 1933 crop of wheats and flours milled therefrom.

[**Field crops research in Ohio**] (*Ohio Sta. Bul. 548* (*1935*), *pp. 16, 17, 21–28, 29–31, 51, 52, 53, 54, 96, 97, 98, 99, 100, figs. 5*).—Experimentation with field crops (E. S. R., 71, p. 311), for which results are reported briefly, dealt with the comparative response of corn to fertilizers in dry and favorable seasons, by R. M. Salter; the value of sweetclover as a green manure for corn, by E. E. Barnes; the effect of early grazing on pasture production, by D. R. Dodd; corn hybrid and variety experiments, by G. H. Stringfield; a new hybrid wheat, T. N. 1006, for Ohio, by C. A. Lamb; rainfall as an index of the probable protein

content of wheat, by E. G. Bayfield; the concentration of mineral nutrients in the corn plant as affected by fertilizer treatment, by J. D. Sayre and V. H. Morris; the reaction of different forage crops to seasonal conditions, by C. J. Willard; the relative yield and composition of spring cereals, flax, and field peas grown alone and in various mixtures and harvested for grain, by L. E. Thatcher; the control of the lawn weeds yarrow and creeping buttercup, by F. A. Welton; the benefits from aerating potato soils with tile under the rows, benefits from adding corn fodder to potato plats at the time of spring plowing, the merits of the Chippewa potato, and the response of potatoes to fertilizer on muck soil, all by J. Bushnell; the superiority of Sudan grass and corn over soybeans as a plow-down crop for potatoes under extreme drought conditions, by Bushnell and W. E. Weaver; the effects of such field practices as time of topping, suckering, time of harvesting, and row fertilization on the yield and quality of tobacco, by H. M. Wachter; the merits of different rotations for sugar beets, by M. A. Bachtell and R. C. Beatty; seeding experiments with oats, by Bachtell and H. S. Elliott; the response to limestone of a one-yr. meadow mixture of alfalfa, clover, and timothy sown in wheat, by Bachtell and C. B. Harvey; the value of meadows for the roughage part of the dairy ration and in soil erosion control, by Bachtell and W. Mahan; and a curing experiment with emergency hay in rainy weather, by L. W. Sherman. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops work in Puerto Rico in 1934] (*Puerto Rico Sta. Rpt. 1934, pp. 2–9, 18, 19, 20, figs. 3*).—Brief reports are given again (E. S. R., 71, p. 311) on the progress of breeding work, trials of seedlings, hybrids, and introduced varieties, and adaptation tests of Mayaguez varieties and their distribution, all with sugarcane; selection work with yams; fertilizer trials with dasheens, taros, and yautias; and comparisons of corn varieties and spring- v. fall-planted corn. The yields and other characteristics of Mayaguez 28 and 63, P. O. J. 2878 (E. S. R., 72, p. 179), and other seedlings are also discussed.

Improved varieties of crops produced at Pusa, F. J. F. Shaw and K. Ram (*Agr. and Livestock in India, 4 (1934), No. 5, pp. 465–480*).—Outstanding characteristics are given for improved varieties of wheat, barley, oats, rice, pigeonpea (*Cajanus indicus*), gram, mung, urid, lentil, seed flax, sesamum, safflower, peppers, hemp (*Hibiscus cannabinus* and *H. sabdariffa*), tobacco, and *Nicotiana rustica*.

Recent progress in plant breeding at Pusa, B. P. Pal (*Agr. and Livestock in India, 4 (1934), No. 5, pp. 505–515*).—Recent plant breeding work, including some genetic studies, is reviewed for wheat, rice, barley, oats, seed flax, sesamum, safflower, pigeonpea, mung bean, lentil, gram, *Brassica* spp., tobacco, pepper, hemp, *Crotalaria juncea*, and Indian hemp.

Plant breeding opportunities with pasture and meadow plants, F. D. Keim (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 254–260*).—Needs for improvement in cultivated grasses and legumes and native grasses are pointed out, with remarks on the adaptation of forage plants under various climatic conditions of Nebraska.

Pasture areas in the United States, H. N. Vinall (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 161–172, figs. 4*).—The five pasture regions of the United States are described as to temperature, precipitation, topography, soil relations, and vegetation.

Five years results on monthly clipping of pastures, R. H. Lush (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 295–299*).—Pasture (E. S. R., 70, p. 231) yields were higher in April and August than in other months when clipped at 30-day intervals for 5 yr. in Louisiana Experiment Station studies. February grass,

on a dry matter basis, contained nearly twice as much crude protein as that cut in September. Calcium, and to some extent phosphorus, decreased from spring to late summer. Dry matter and fiber content increased as the season advanced, while other constituents were quite uniform. Samples representing the same growth period were similar in chemical composition regardless of species or genera or fertilizer. Distribution of rainfall, maximum and minimum temperatures, and shading were other factors influencing growth rate and consequent composition and yield of pasture vegetation.

The response of grasses and clover to treatment on acidic upland soils, and the effect of herbage plants on the reaction of acidic soils.—Part II, The effect of herbage plants on Molinia soil, R. O. Davies and H. G. Chippindale (*Empire Jour. Expt. Agr., 3 (1935), No. 9, pp. 50–59, figs. 4*).—Field studies described earlier (E. S. R., 72, p. 607) were supplemented by pot tests to compare the effects of cultivated grasses and of wild white clover on the acidity and the nitrogen metabolism of the Molinia soil. The grasses, and to a lesser extent the wild white clover, were found to lower the acidity of the soil and drainage water. The direct effect of small dressings of basic slag and limestone on the pH of this acid soil is very small, but the indirect effect is much greater, due to the increased herbage growth they encourage. Examination of the drainage water revealed that nitrate nitrogen, even when present in high concentration, is removed rapidly by the grasses, which thus conserve soluble nitrogen.

Nitrogen applied as nitrochalk during 1931 was completely recovered in the grasses in the same season, during which the effect of calcium carbonate and ammonium nitrate was to increase the availability of soil nitrogen. Much faster synthesis of plant protein was obtained in pots where wild white clover was grown than in pots where perennial ryegrass and red fescue were treated intensively with soluble nitrogen. However, more total nitrogen could be accounted for in the clover soil.

Manual of the grasses of the United States, A. S. Hitchcock (*U. S. Dept. Agr., Misc. Pub. 200 (1935), pp. 1+1040, figs. 1696*).—This comprehensive manual includes descriptions, usually with illustrations and indicated distributions, for all of the grasses known to grow in the continental United States, excluding Alaska. There are 159 numbered genera and 1,100 numbered species, of which 44 genera and 151 species are introduced. Descriptions of the two subfamilies of Gramineae (Poaceae), the 14 tribes, the genera, and the species, with appropriate keys, are presented in practically the same sequence as in an earlier work (E. S. R., 42, p. 828). Information is given on the uses, distribution, morphology, classification, and nomenclature of grasses. The book also includes a synonymy embracing all of the names published for grasses in the United States, a list of persons for whom grasses have been named, a glossary, and an index.

The effect of soaking in water on the "seeds" of some Gramineae, H. G. Chippindale (*Ann. Appl. Biol., 21 (1934), No. 2, pp. 225–232*).—With most species of Gramineae tested, acceleration of germination resulted from presoaking, but this might be slight under optimum soil conditions. Dryness of soil and relatively low temperature greatly increased the differentiation between germination of soaked and untreated seeds. Closely related species, as *Lolium italicum* and *L. perenne* and *Festuca pratensis* and *F. elatior*, differed considerably in behavior. In no species was acceleration due to soaking so pronounced as in *Dactylis glomerata* (E. S. R., 70, p. 469). Acceleration resulting from presoaking *Avena sativa* was caused by the start given early processes of germination.

Preliminary experiments on vernalisation, G. D. H. BELL (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 245–257, figs. 4*).—Low temperature grain pretreatment (E. S. R., 70, p. 166) of some varieties of wheat, barley, and oats at Cambridge University usually resulted in a stimulation to early development of the plant, with a modification of the juvenile habit. Winter, but not spring, varieties of barley and wheat also showed marked acceleration in the date of heading. Greenhouse culture during the first few months of growth resulted, in most varieties, in a greater response to the pretreatment, possibly due to the absence of low temperatures. Response to low temperature pretreatment appeared to be a varietal character.

Investigations into the water requirement of crop plants, B. N., R. B., and K. SINGH (*Indian Acad. Sci. Proc., 1 (1935), No. 9, Sect. B, pp. 471–496, figs. 14*).—Studies at Benares Hindu University Institute of Agricultural Research involving varieties of barley, oats, flax, mustard, potatoes, peas, tobacco, wheat (4), rice (9), cotton (16), and sugarcane (21 types) showed the minimum water requirement per acre, both for transpiration and soil evaporation, to vary greatly with different crops. Sugarcane required 45 acre-in., tobacco 30.1, cotton 28.3, rice 27.4, potatoes 20.4, wheat 8.5, oats 8.1, barley 7.8, flax 6.4, pea 5.6, and mustard 4.34 acre-in. of water for the whole life cycle. The seedling, preflowering, flowering, and seed formation stages are critical periods of the highest water requirements when the crop should be irrigated adequately if soil moisture is lacking.

The water requirement seemed to control yield of the varieties, indicating its value in the selection of high yielding strains. The length of the life cycle in general exercises great influence over the water requirement of varieties; in the most efficient varieties the life cycle seems to be cut short and water use reduced to a minimum. Varieties of the same crop differ appreciably in water requirement, and the most efficient ones, due to their generally high yielding nature and short life cycle, should be adopted to reduce the number of irrigations and production cost.

Some factors affecting the influence of soybeans, oats, and other crops on the succeeding crop, D. R. DODD and G. G. POHLMAN (*West Virginia Sta. Bul. 265 (1935), pp. 23, figs. 2*).—Experiments reported on dealt with the effects of soybeans and other crops, and the date of removing soybeans, on the yield of following crops and on the nitrate content of the soil, and ways to counteract the depressing effect of the late removal of soybeans.

Yields of wheat, oats, and corn were higher after soybeans harvested for hay than after oats harvested for grain. The difference in yields of wheat and corn appeared to be related to differences in the nitrate content of the soil. Yields of buckwheat and potatoes were not affected differently by preceding crops of oats or soybeans. Oats after oats, buckwheat, or corn yielded less than oats following wheat and potatoes. Soybeans yielded less after corn than after wheat, oats, potatoes, and buckwheat. Wheat following soybeans removed September 20, when soybeans were about ready to be cut for seed, yielded less than wheat after soybeans removed August 10 or 30.

The nitrate content of the soil was low at the time of the removal of the soybeans, but increased rapidly thereafter. Additions of sodium nitrate, 50 lb. per acre, counteracted the harmful effect of late removal of soybeans on the yield of the succeeding wheat crop. The time of removing soybeans did not affect the yield of the succeeding corn. Ample time, about 3 weeks, should be allowed after the removal of the soybeans for the available nitrogen to be replenished before the next crop is planted. An alternative was to add fertilizer containing nitrogen at the time of planting.

Approved practices for alfalfa growers, P. H. Kime and H. R. Mann (*North Carolina Sta. Bul. 300 (1934), pp. 8*).—Practices recommended for alfalfa production in North Carolina, based extensively on results of station experiments, deal with the choice of varieties and soils, the use of lime and fertilizers, tillage and cultural practice, cutting and curing methods, inoculation, and the control of weeds and insect pests.

Factors influencing seed-setting in alfalfa, J. M. Armstrong and W. J. White (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 161–179, pl. 1, figs. 5*).—Pollination and fertilization in alfalfa was studied at Ottawa and Saskatoon, Canada, in plants of Grimm and certain normally self-fertilized, high seed-setting selections.

High seed-setting types did not differ from low seed-setting types in stage of anther dehiscence, amount and distribution of pollen, or relative length of pistil and anthers. Anther dehiscence in both types began regularly in the pointed bud stage, and pollination was completed at the erect standard stage. Pod setting was shown to depend upon flower tripping. Tripped flowers set a high proportion of pods, while untripped flowers invariably wilted and dropped. The high seed-setting capacity of certain selected autogamous plants seemed due largely to fertilization by spontaneous tripping. Morphological differences between the tripping mechanism of high and low seed setters were identified, automatic tripping in the former being more or less independent of environment. Pollen germination occurred in 84 percent of tripped flowers and in 0.6 percent of untripped flowers examined. In the act of tripping, the stigmatic surface evidently is ruptured and the released stigmatic content initiates pollen germination. Rupturing of the stigmatic surface is essential to penetration by pollen tubes. Pollen sterility is shown to be a factor in seed setting in determining the percentage of pods produced and the number of seeds per pod.

Yields of barley in the United States and Canada, 1927–31, H. V. Harlan, P. R. Cowan, and L. Reinbach (*U. S. Dept. Agr., Tech. Bul. 446 (1935), pp. 80*).—The yields of barley obtained on the testing fields of the United States and Canada are compiled for the years 1927 to 1931, inclusive, as in an earlier report (E. S. R., 62, p. 330). Outstanding varieties grown at the experiment stations in the United States and Canada during the period are tabulated. Trebi produced the highest average yield at 31 stations, Bearer and Alpha at 4, and Horn, Club Mariout, and Velvet at 3. Hannchen also was prominent. Of the newer varieties, Wisconsin Pedigree 38, Regal, Glabron, and certain unnamed smooth-awned barleys were rapidly assuming importance.

Cultural practices in corn production, T. A. Kiesselbach, A. Anderson, and W. E. Lyness (*Nebraska Sta. Bul. 293 (1935), pp. 20, figs. 2*).—The results of comparative tests of methods of seed bed preparation for corn and planting and cultivation practices, 1914–33, are summarized. Time- and rate-of-planting tests, 1929–33, were in cooperation with the U. S. Department of Agriculture. Progress results have been noted earlier (E. S. R., 61, p. 129).

Plowing in early spring, 1922–32, averaged 5 percent more grain per acre than late spring plowing and 18 percent more than fall plowing. With late spring plowing, previous early spring disking increased the yield 3 percent. Early spring plowing from 4 to 10 in. deep for surface-planted corn yielded from 30.5 to 33.5 bu. per acre. However, plowing deeper than 7 in. seemed impractical.

The extreme variation in yield was 3.1 bu. per acre among six methods of seed bed preparation in connection with furrow planting, which averaged 32.7 bu. Yields were essentially alike from the most productive listing and surface-planting practices. During 11 yr., surface-planted corn gave practically equal

yields whether checked or drilled, although checked corn could be kept free from weeds more easily by cross cultivation. Spacing the corn rows double distance, or 7 ft. apart, reduced the grain yield 28 percent with a normal stand of plants per row and 14 percent with double the number of plants per row, or the normal number per acre. No consistent superiority was shown for any given date of planting in tests ranging from April 25 to June 14 over 12 yr. Indications were that there may be some departure from standard planting rate and considerable variation in the uniformity of a stand of corn without materially affecting the yield per acre. Seed corn obtained from numerous farmers was not benefited materially by treatment with any commercial seed corn disinfectant, and such treatment is not recommended as a general practice in Nebraska.

Weed control, according to the results of cultivation tests, appeared to be the main consideration in corn cultivation. Considerable latitude seemed permissible in adjusting the corn cultivator without affecting yields materially, provided the plant is not injured noticeably. Shallow, medium, deep, and close cultivations, all in one direction only, with a 6-shovel cultivator yielded 32.9, 34, 35.2, and 34.5 bu. per acre, respectively, during 11 yr. Special root-pruning studies showed that little permanent injury might be expected where the pruning depth is not below about 5 in. and is 9 in. or more away from the plant. Pruning as deep as 6 in. and completely circumscribing the plant at a distance of 7 in., either at the final or at all cultivations, lowered the grain yield 12 percent and at the second cultivation 8 percent, while there was no material effect when done only at the first cultivation. The most severe pruning, 6 in. deep at a 4-in. distance, lowered the grain yield 20 percent. It was apparent that whatever root injury accompanies normal cultivation is not likely to prove harmful.

The effect of shade on American cotton, R. L. Knight (*Empire Jour. Expt. Agr., 3 (1935), No. 9, pp. 31–40, figs. 5*).—The effects of continued clouds on cotton, as simulated by cloth sheets, were studied near Khartoum, Sudan. The shading (medium) with cotton cloth reduced the production and shedding of buds, flowers, and bolls, and also the shedding of leaves and the incidence of black arm. Yield was reduced by nearly two-thirds. Increases occurred in plant height, height of the first sympodium, lint length, and in pest incidence (bollworm, aphid, and Jassid). Under double Hessian (heavy) shade, bud production was much further reduced and blooming and bolling prevented completely. Bud development in the lower region of the main stem was suppressed so that the lowest sympodia arose very high upon the stem. Sympodia were extremely short, and there were large reductions in plant height and in the number of main stem nodes, in leaf shedding, and in the incidence of black arm. Diameters of stem and root and the proportion of xylem to the other tissues were smaller, the roots were less lignified, and rooting was not so deep as in the other treatments. Continued cloudiness evidently may be a major factor in lowering cotton yields.

Intervarietal competition in yield trials with cotton, B. G. Christidis (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 231–237, fig. 1*).—Yield data from a test of 9 cotton varieties grown in single-row plots 10-replicated in a randomized block system by the Greek Cotton Institute showed a variation, attributed to competition, ranging from 0 to ±6 percent of the mean. Two groups could definitely be distinguished as including the best and worst competitors, although the best yielder was not always the best competitor, or vice versa. Plant height data did not show indications of competition, presumably due to an opposite effect of shading. The competitive value of a variety seemed to depend upon that of the other competing varieties.

Dormancy and maturity of cottonseed, D. M. SIMPSON (*Jour. Agr. Res. [U. S.], 50 (1935), No. 5, pp. 429–434*).—Experiments at James Island, near Charleston, S. C., indicated that freshly opened cotton bolls contain a considerable percentage of dormant seed. This dormancy could be eliminated by drying and storing the seed for a short period. No appreciable difference in dormancy of fresh seed was observed among several upland varieties, and the sea island strain tested showed practically no dormancy. Seed maturity studies indicated that cottonseed reaches maturity shortly before the bolls begin to open, from 40 to 50 days after flowering at James Island.

Viability of cottonseed as affected by field conditions, D. M. SIMPSON and B. M. STONE (*Jour. Agr. Res. [U. S.], 50 (1935), No. 5, pp. 435–447*).—Experiments at James Island, S. C., in 1931, 1932, and 1933, under conditions of frequent rainfall and high humidity indicated definite relations between seed viability and the weather conditions prevailing while the seed cotton is exposed in the field.

Cotton harvested at James Island normally contains excessive moisture. Determinations during the boll opening period showed that seeds from bolls just cracking open contained about 50 percent moisture, and that seed from partially opened bolls ordinarily harvested by the pickers may exceed 28 percent in moisture. Dry weather caused rapid reduction in the moisture content of seed and seed cotton, but rainy, humid, or cool weather prevented drying and delayed boll opening. Low viability of seed harvested in unfavorable weather indicated that seed deterioration occurs in the field before harvesting. Seed from bolls just opening, when dried and stored for a short time, gave higher germination percentages than did seed exposed longer in the field. Seed taken from bolls exposed for varying periods in the field showed that seed deterioration was correlated with rains or humid conditions which prevented the prompt drying of seed cotton after the bolls began to open. Seed from bolls opening and harvested during dry weather gave higher germination percentages than did seed from bolls opening and harvested during rainy weather. Varietal differences in resistance to field deterioration were apparent. The possibility of improvement in germinating qualities by selective breeding is suggested.

Relation of moisture content and method of storage to deterioration of stored cottonseed, D. M. SIMPSON (*Jour. Agr. Res. [U. S.], 50 (1935), No. 5, pp. 449–456, fig. 1*).—Storage experiments with sea island and upland cottonseed under the humid conditions prevailing at James Island, S. C., demonstrated that in ordinary storage cottonseed deteriorates rapidly after 2 yr. The moisture content of the seed during storage and rapidity of deterioration were definitely related. Sea island seeds, with a moisture content reduced below 8 percent and stored in tin containers to prevent rapid reabsorption of moisture, retained their germination percentage with but slight impairment for 4½ yr. Upland cottonseed stored under various conditions and containing from 8.75 to 13.78 percent moisture deteriorated rapidly when the moisture remained above 10 percent. Dried seed stored to prevent reabsorption of moisture showed only slight deterioration after 2½ yr. Seed containing 13.78 percent moisture and stored to prevent drying were all dead 9 mo. after storage began.

The grass genus Gouinia, J. R. SWALLEN (*Amer. Jour. Bot., 22 (1935), No. 1, pp. 31–41, figs. 5*).—This taxonomic discussion of the genus *Gouinia* includes a key to the 13 species, with descriptions and geographical distribution.

A study of the factors influencing size of potato tubers, G. H. BATES (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 297–313, fig. 1*).—Spacing and size of seed tests with the King Edward potato variety demonstrated that

spacing influences yield in that, beyond certain limits, the yield decrease is proportionate to the increase in distance between the sets. The optimum distance in this respect varies with size of seed. Seed size influences yield and size of tubers produced, large seed giving higher yields than small, whereas small seed gives larger individual tubers with the same spacing. Large seed possesses more sprouts per tuber than medium or small seed, and thus gives rise to more true plants within the hill. As the number of true plants per hill increases, more but smaller tubers are produced per hill.

Sensitivity of the potato plant to soil aeration, J. Bushnell (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 251–253, fig. 1*).—Substantial increases in potato yields were obtained, 1929–32, at the Ohio Experiment Station on plats of Wooster silt loam in which 3,600 and 7,200 cu. ft. of sand per acre had been incorporated into the top soil. Similar increases were obtained, 1933–34, when potatoes were planted directly above tile, both plain and perforated, laid 5 in. deep. Potatoes over perforated tile outyielded those over plain tile and untiled, in order. Roots were distinctly more abundant around the tile, where they had formed a network, than in the main body of the soil. The results suggested that the potato plant is peculiarly sensitive to soil aeration, and that insufficient aeration may often be a limiting factor in potato yields on silt loam and heavier soil types.

Is there any difference in the productivity of dry land and irrigated seed potatoes? H. O. Werner (*Amer. Potato Jour., 12 (1935), No. 3, pp. 64–67*).—Comparative yields produced from dry land and irrigated Triumph potato seed at Alliance (dry land) and Scottsbluff (irrigation) in Nebraska Experiment Station tests and in similar tests by seven cooperating experiment stations in the South, 1929–31, considered together with earlier and other results, indicated that production under irrigation does not impair the seed value of seed stocks that are free from virus diseases.

The comparative value of calcium cyanamid and ammonium sulphate on the yield of Irish potatoes on Bladen fine sand, H. Sherard (*Amer. Potato Jour., 12 (1935) No. 4, pp. 86–90*).—Calcium cyanamide did not injure potatoes when mixed with the soil 2, 4, and 6 weeks before planting at the University of Florida, even at the rate of 402 lb. per acre, and 900 lb. produced no injury under greenhouse conditions. Calcium cyanamide produced better potato yields than did equal amounts of ammonia from ammonium sulfate, and mixtures of calcium cyanamide and ammonium phosphate gave better yields than did mixtures of calcium cyanamide, ammonium sulfate, and superphosphate. Dolomite and gypsum used with ammonium phosphate mixtures increased yields on virgin soil under greenhouse conditions, but had little or no effect in fields previously fertilized. Increase in calcium cyanamide increased yields and the pH value and replaceable calcium in the soil, while an increase in ammonium sulfate resulted in decreases.

The breeding behavior of the Katahdin potato, C. F. Clark and F. J. Stevenson (*Amer. Potato Jour., 12 (1935), No. 3, pp. 55–59*).—According to results obtained in potato breeding work of the U. S. D. A. Bureau of Plant Industry, the Katahdin potato (E. S. R., 70, p. 177) carries one of the complementary factors for red skin color of tubers and also a complementary factor for a light type of russeting. The many color classes into which its inbred progeny segregated indicated the presence of three basic complementary factors for flower color. It appeared to be heterozygous for at least part of the factors for tuber shape, although a high percentage of short tuber types may be expected when Katahdin is crossed with varieties having short tubers. A high percentage of tubers with shallow eyes is anticipated in progenies in which

it is a parent. Katahdin seems to carry two heterozygous factors for resistance to late blight, and it has transmitted resistance to mild mosaic. Indications were that Katahdin transmits resistance which prevails under conditions of natural field exposure to a type of latent mosaic expressed in certain varieties as top necrosis.

The Katahdin versus the Irish Cobbler for September markets, E. J. WHEELER (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 152–155*).—Katahdin potatoes (E. S. R., 70, p. 177) matured about 20 days later and in all dates of planting yielded 56 percent more salable potatoes than did Irish Cobblers. When planted early, Katahdin surpassed Irish Cobblers in yield and in quality for the late August and early September market.

Seed potato production in central Nebraska, H. O. WERNER and L. L. ZOOK (*Nebraska Sta. Bul. 294 (1935), pp. 16*).—Experiments at the North Platte Substation in cooperation with the U. S. Department of Agriculture and the Department of Agriculture of the Bermuda Islands indicated that production of seed potatoes on dry land in the central Nebraska district may be feasible if good seed stocks are grown by proper methods in isolated fields. The greater precautions necessary make seed potato production under irrigation seem less desirable for the section.

Prevalence of virus diseases was a major factor causing variations in the seed value of potatoes produced at North Platte. On dry land, spindle-tuber disease spread less than in irrigated fields, and consequently, when spindle tuber was present dry-land seed was more productive. When healthy seed was used, yields differed little. Early harvesting, especially of irrigated potatoes, resulted in a more productive seed than did late harvesting. Tubers harvested late from vines cut off early were intermediate in seed value between tubers harvested early and those harvested late from uncut vines. Early emergence and good stands generally were followed by high yields. Potatoes planted on dry land usually made very little increase in yield after early August, when vine maturation generally was well under way. Dry-land-grown potatoes harvested early, if practically free from spindle tuber, tended to be the most productive when planted in irrigated plats for comparison. Tubers from vines just starting to ripen seemed more desirable than very immature tubers harvested earlier. Dry-land-grown tubers harvested late from vines cut off early produced less than those harvested early, but outyielded those harvested late from normally maturing vines. Potatoes stored continually in a potato cellar yielded more than those held in cold storage for all or part of the storage period.

The effect of long and short day and shading on nodule development and composition of the soybean, E. W. HOPKINS (*Soil Sci., 39 (1935), No. 4, pp. 297–320, pl. 1, figs. 4*).—Manchu soybean plants were grown in long and short days, about 16 and 7 hr., respectively, with a high and low nitrate series in one experiment, and minus nitrate in another. Shaded and full light experiments, with and without nitrate, were made out of doors.

The short day-length plants accumulated much starch and also were high in nitrogen in both plus and minus nitrate experiments. In the minus nitrate experiment, carbohydrate accumulation increased in the short day-length plants as the plants became older, and the nitrogen was present in more simple compounds at the second harvest than at the first. Plants receiving long day treatment were lower in all forms of nitrogen and in carbohydrates, particularly in the stems, than the short day plants. In the minus nitrate experiment, a first harvest was made at the time of nitrogen hunger and another at blooming. The carbohydrate percentages of roots, leaves, and nodules decreased, and all forms of nitrogen greatly increased, in all plant parts as the plants grew older.

Shaded plants in both plus and minus nitrate experiments were generally lower than the unshaded ones in carbohydrates and higher in all forms of nitrogen. In the minus nitrate experiment, shaded and unshaded plants decreased in percentage carbohydrates from the first harvest to the second, while all forms of nitrogen increased in both series.

Weight of nodules, expressed as percentage of the whole plant weight, was lowered by high nitrate, by short day, and by shading. In general, treatments resulting in accumulation of soluble nitrogen did not favor nodule development, while, except in short day plants, conditions producing high carbohydrate plants favored nodule development.

Variety tests of sugarcanes in Louisiana during the crop year 1932–33, G. Arceneaux, I. E. Stokes, and C. C. Krumbhaar (*U. S. Dept. Agr. Circ. 343 (1935), pp. 35*).—Comparative tests of commercially grown and new varieties of sugarcane (E. S. R., 70, p. 328), continued during the crop year 1932–33 and including plant cane and first- and second-stubble tests on light and heavy soils and third-stubble tests are reviewed, with information on the parentage and characteristics of Co. 290, C. P. 28/11, and C. P. 28/19, and fiber percentages in cane of several varieties.

The more recent introductions, C. O. 281, C. P. 807, and Co. 290, according to these and earlier tests, have rendered the P. O. J. 36, P. O. J. 213, and P. O. J. 36-M more or less obsolete, and have greatly lessened the importance of P. O. J. 234. Results obtained in comparison with standard varieties at seven locations in 1933 confirmed preliminary estimates based on limited tests at Houma, indicating that the new seedling C. P. 28/19 surpasses Co. 281 and approximates P. O. J. 234 in sugar-per-ton capacity, and has a sugar-per-acre productiveness slightly exceeding that of C. P. 807 under prevailing conditions. Further evidence is presented on the outstanding value of Co. 290, which was released in the fall of 1933 for commercial culture and attracted much attention because of heavy yields of cane and indicated heavy yields of sugar per acre.

Boron deficiency in tobacco under field conditions, J. E. McMurtrey, Jr. (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 271–273, fig. 1*).—Pronounced effects of boron deficiency (E. S. R., 69, p. 362) in tobacco became apparent after using relatively pure chemicals in preparing fertilizer mixtures for tobacco on a sandy phase of the Collington soil series at Upper Marlboro, Md., for 5 yr. Distinctive effects of boron deficiency are described.

Soft winter wheat studies.—III, The effect of some factors influencing viscosity and protein, E. G. Bayfield (*Cereal Chem., 12 (1935), No. 1, pp. 1–16*).—The third of this series (E. S. R., 72, p. 474) reports on an attempt made to separate quality from quantity factors existing in the protein content of flours. Quantity of protein was measured readily, and the viscosity results were well correlated with results from baking tests. Quality of protein produced much less influence upon viscosity when only one variety of wheat was used throughout the series, but when several varieties were compared, decided differences in quality were obtained. Response to tests with potassium bromate when used in baking these varieties seemed due to quantity rather than quality of protein.

Applications of fertilizers to the soil growing the wheat produced large variations in quantity of protein, whereas the differences in quality noted were small and the results inconclusive. Nitrogen, potassium, and phosphorus as fertilizers produced decreasing amounts of protein in the order given.

Observations on the whole wheat meal fermentation time test, E. G. Bayfield (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 241–250*).—When the whole

wheat meal fermentation time test of Cutler and Worzella (E. S. R., 71, p. 418) was applied to two series of soft winter wheats at the Ohio Experiment Station, unsatisfactory results were obtained because uniform conditions do not hold over the range of strength found in this class of wheats. With weak wheat samples the dough mass does not stick to the sides of the beaker as with strong samples, so that strength differences as measured by time are exaggerated. Sticking of the samples in many cases masked any differences caused by possible diastatic activity deficiencies. The 5-g dough ball recommended by Pelshenke was found to give results superior to those obtained by the larger sized doughs. Even with these smaller dough balls, however, a disturbing influence was noticeable, possibly due to diastatic differences in samples. Closer agreement was obtained between viscosity results, loaf volumes, and protein contents than between the time data and the other determinations employed as comparative measures.

Rapid determination of moisture in grain, W. H. COOK, J. W. HOPKINS, and W. F. GEDDES (*Cereal Chem., 12 (1935), No. 3, pp. 230–244, figs. 2*).—Comparisons of results obtained by rapid analytical methods and moisture meters showed the Brown-Duvel method to be as accurate with hard red spring wheat throughout the entire moisture range studied as the motor-operated Tag-Heppenstall was over the limited range, 11–17 percent. At higher moisture contents, or with any of the other grains used, the former method was superior in accuracy to any of the electrical testers. The 130° C. air-oven method, using a Wiley mill for grinding, was also more accurate than any meter except the motor-operated Tag-Heppenstall in the low moisture range with hard red spring wheat. The results as a whole indicate that the motor Tag-Heppenstall appeared to be the most accurate of the moisture meters examined for all grains except oats, for which the Limbrick was best.

Seed inspection in Kentucky, 1932–1934, W. A. PRICE, E. C. VAUGHN, E. DEEN, J. TAYLOR, and A. MARRS (*Kentucky Sta. Regulat. Ser. No. 6 (1935), pp. 15*).—The purity and germination percentage and presence or absence of noxious weeds are tabulated for 282 official samples of seed collected in Kentucky from July 1, 1932, to June 30, 1934, inclusive.

Field experiments on the action of calcium cyanamide on germinating seeds and on charlock in barley, H. L. RICHARDSON (*Empire Jour. Expt. Agr., 3 (1935), No. 9, pp. 41–49, fig. 1*).—Field experiments at the Rothamsted Experimental Station on the effect of time and method of applying calcium cyanamide to seed beds for wheat, alfalfa, swedes, and radishes showed that dressings up to 3 cwt. per acre given 1 week or more before planting did not interfere with germination. The interval between applying the fertilizer and planting the seed might safely be reduced to a few days, or even in favorable conditions to a few hours, for moderate applications, provided that the fertilizer was cultivated into the soil before planting. A moderate application 2 days after planting the seed was found to be safe if the fertilizer was left undisturbed on the soil surface. In a field trial on charlock destruction in barley, with comparisons under different weather conditions, calcium cyanamide proved much less efficient than kainite or a solution of copper sulfate. Both the barley and the weeds surviving the cyanamide treatment responded to the added nitrogen.

The absorption and translocation of herbicides, A. MORGAN (*Jour. Dept. Agr. Victoria, 33 (1935), No. 4, pp. 200–208, figs. 2*).—This review features the use and action of arsenicals and chlorates in weed eradication and cites pertinent data from hoary cress control studies (E. S. R., 71, p. 191) at Werribee State Research Farm.

HORTICULTURE

[Horticultural studies by the Arizona Station] (*Arizona Sta. Rpt. 1934, pp. 27–32, 52–54, 58–68, figs. 2*).—Included are reports upon experiments in the control of soil temperature in citrus orchards by the use of mulches, cover crops, and irrigation; the consumptive use of water by citrus trees; pollination of pecans; causes of failure of pecan nuts to fill properly; differences in viability and growth in pecan seedlings; development of an experimental pecan orchard near Yuma; fertilizers for orange and grapefruit; the storage of grapefruit; varieties of dates; relation of maturation and storage of dates; relation of temperature to growth of the date fruit; ripening of dates removed from the palm in clusters; pollination of the date; irrigation of lettuce seed beds; fertilizing of lettuce; varieties and culture of strawberries; and the precooling of cantaloups prior to shipment.

[Horticultural studies by the Fruit and Truck Experiment Station], B Szymoniak (*Louisiana Sta., Fruit and Truck Sta. Rpt. [1934], pp. 1–4, 11, 12–16*).—The following experiments are briefly discussed: Fertilization, propagation, liming, cultural treatment, and variety testing of strawberries; fertilizing and liming of sweet peppers; fertilizing of beans, cucumbers, cabbage, sweetpotatoes, and Satsuma oranges; fertilizing and pruning of muscadine grapes; productivity of tung-oil trees; and observations on miscellaneous fruits.

[Horticultural studies by the Maine Station] (*Maine Sta. Bul. 377 (1934), pp. 374, 375, 384–388, 391–393, 397–401, figs. 6*).—Brief progress reports are presented on studies in the breeding and pollination of apples, the relation of apple tree shape to yield and growth, strawberry, raspberry, and grape varieties, breeding of sweet corn, snap bean varieties, lettuce varieties and mulching, tomato varieties and breeding, and cucumber breeding, all by R. M. Bailey and I. M. Burgess; varieties of blueberries and field management and weed control in blueberry plantations, both by F. B. Chandler and I. C. Mason; fertilizers for blueberries and control of water heart in rutabagas, both by Chandler, J. A. Chucka, and Mason; and fertilizer and lime requirements of sweet corn, by Chucka, Bailey, and D. B. Lovejoy.

[Horticultural studies by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 22, 40, 41, 42*).—In this report there are presented brief accounts of the results of experiments on the relation of waxing nursery stock to survival and subsequent injury and Norway spruce Christmas trees to needle fall; varieties of fruits; causes of the poor control of pests by spraying; arsenical injury to peaches; consumer demand for pears; grape production costs and returns; relation of light intensity to fruit setting in the sour cherry; and bud sports of fruits.

[Horticultural studies by the Michigan Station] (*Michigan Sta. Rpt. 1934, pp. 201, 202, 229*).—Brief reports are presented on an investigation of the fundamental colloid chemical principles involved in the preparation and use of emulsions, by E. J. Miller, and on testing new peach varieties, by V. R. Gardner.

[Horticultural studies by the New Hampshire Station] (*New Hampshire Sta. Bul. 284 (1935), pp. 18–22, 23*).—The results are briefly discussed of experiments on the effects of deeply incorporated phosphorus fertilizers on blossom bud formation in the apple, by G. F. Potter; apple pollination, by L. P. Latimer; changes in apples during storage, by E. J. Rasmussen; varieties of apples, raspberries, strawberries, and grapes, by Latimer, Potter, et al.; comparison of nitrogen alone and complete fertilizers for apples, by Potter; and vegetable breeding and peat v. manure for greenhouse tomatoes, both by J. R. Hepler.

[Horticultural studies by the Ohio Station], J. B. Park, F. S. Howlett, C. W. Ellenwood, [J. S.] Shoemaker, H. D. Brown, I. C. Hoffman, D. Comin, G. H. Poesch, A. Laurie, and G. R. Mann (*Ohio Sta. Bul. 548 (1935), pp. 28, 29, 46–48, 49–51, 52, 53, 54–56*).—The following studies are briefly discussed: The improvement of sweet corn by hybridization and selection; cultural systems for pear and apple trees; the irrigation and mulching of strawberries; the hardiness of peach varieties; fertilization of lettuce; breeding of greenhouse tomatoes and lettuce; irrigation of truck crops; the effects of controlled day length on chrysanthemums, asters, and kalanchoe; the water requirements of flowering plants; the fertilization of greenhouse plants; the effects of soil reaction on color of hydrangeas and on the growth of snapdragons and other species; the value of cloth protection for flowers; and the propagation of poinsettias.

[Horticultural studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1934, pp. 12–18, 19, 20, figs. 6*).—The results are presented of studies on the response of coffee plants to shading, fertilizers, and spacing; the pruning of Excelsa coffee; improvement of sweet corn by hybridization; and the testing of newly introduced coconuts and hibiscus.

Indiana Baltimore tomato—its history and development, E. C. Stair (*Indiana Sta. Circ. 207 (1934), pp. 12, figs. 3*).—Derived from commercial stocks by individual plant selections so combined that at the present time the improved variety consists of 15 intermingled strains, the Indiana Baltimore tomato has been found distinctly superior in yield and quality to the commercial Baltimore variety. This paper discusses the procedure employed in the improvement of the tomato and sets forth the characteristics of good tomato seed and the costs of producing high quality seed.

How to reduce the occurrence of cracks in tomato fruits, W. A. Frazier (*Canning Age, 16 (1935), No. 7, pp. 279, 280, 290, 294, figs. 3*).—At the Maryland Experiment Station it was found that Gulf State Market tomatoes cracked considerably less in bad seasons than did Globe, Marglobe, Stone, and other varieties grown. Of the two types of cracking, radial and concentric, the former was more common; in fact concentric cracking occurred severely only during rainy periods, particularly those preceded by drought. Greater cracking followed irrigations subsequent to dry periods than where the plants were continuously supplied with abundant water, suggesting that irregular water supply is a contributing factor. Since cracking was reduced by enclosing fruits in muslin or cellophane sacks, the author concludes that heavy foliage is desirable in reducing losses. This was further emphasized by the fact that staked, pruned plants bore more cracked tomatoes than did naturally growing plants. Chemical analyses failed to show any definite relation between carbohydrate constituents and cracking. Fruits nearer the main stem cracked more readily than those farther away, but size appeared to be of minor significance.

Artificial culture methods for isolated embryos of deciduous fruits, H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 313–322, figs. 5*).—A review is presented of methods of technic employed in studies at the New York State Experiment Station in which more than 12,000 embryos of sweet and sour cherries, peaches, plums, pears, and apples were cultured in the laboratory under a wide range of varieties, stage of embryo development, mediums, pH, and temperature. The failure of plants developed from nonafterripened embryos to grow normally was overcome by subjecting them to a cool environment (40° F.) for from 6 to 8 weeks, after which the plants assumed a normal rate of growth. Certain of the cherry and peach seedlings so handled are said to be growing satisfactorily in the orchard.

Periods of blossoming of some tree and soft fruit varieties at East Malling, A. B. Beakbane, H. C. Chapelow, and N. H. Grubb (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 100–114*).—Records are presented on the average dates and duration of the blooming period of a large number of apple, pear, plum, cherry, and strawberry varieties.

Effects of temperature on growth, anatomy, and metabolism of apple and peach roots, G. T. Nightingale (*Bot. Gaz., 96 (1935), No. 4, pp. 581–639, figs. 11*).—Observations on young Stayman Winesap apple and Elberta peach trees, growing in sand held constantly at various temperatures from 45° to 95° F. with air temperatures alike for all lots, showed in both species the maximum yield of new root and top growth at 65°, with decreasing amounts above and below this point. At 45° only a few roots emerged through the periderm during the 2 mo. of the study. At 95° no new roots appeared, and the old roots eventually died. The external appearance and the general anatomical structure of the roots at the different temperatures are discussed. Proceeding from low to high temperatures the embryonic tissues of cambium and root tip became increasingly acid in reaction, due apparently to a greater respiratory activity and accumulation of carbon dioxide in the tissues. Nitrate was freely absorbed by new roots at all the temperatures, but the ability of the roots to reduce nitrate to nitrite, ammonium, and amino acids was profoundly affected. In the apple the highest absolute reduction of nitrate in the current roots, as computed on the basis of reducase activity, occurred at 65°. At 65° and lower the current roots of both species were high in percentage of organic nitrogen. The current roots of both plants were extremely low in sugars and starch at 85° and 90°, whereas the old roots of trees at 90° and 95° contained a high concentration of starch, the digestion of which was apparently largely inhibited by the high temperature.

Metaxenia studies with apples, E. S. Degman and E. C. Auchter (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 213–220*).—Starting with a review of the literature, the authors discuss the results of trials conducted in 1933 and 1934 in western Maryland by the U. S. Department of Agriculture in which controlled pollinations were made with a number of varieties of apples possessing rather wide differences in color, shape, time of maturity, and other characters. Observations failed to reveal any differences in external appearance or time of ripening that could be associated with pollen parents. Detailed measurements showed that the only characters to vary as a result of pollination were weight of apple and number and weight of seeds. Fruits from York Imperial × Rome Beauty were significantly heavier than those from York Imperial × Yellow Transparent. The effect of pollen in certain combinations varied with the available leaf area per fruit. In all varieties used there was noted a low correlation between the number of seeds and the weight of the fruits. There was no consistent effect of pollen parent on acid content of the fruit. The authors conclude that there was very little metaxenial effect of the different pollens employed.

Malling stocks and French crab seedlings as stocks for five varieties of apples, I, W. H. Upshall (*Sci. Agr., 15 (1935), No. 8, pp. 535–541, figs. 8, Fr. abs., p. 541; also in Amer. Soc. Hort. Sci. Proc., 31 (1934), p. 124*).—Observations at the Horticultural Experiment Station, Vineland, Ont., on the growth and flowering of Rhode Island Greening, Melba, Delicious, Northern Spy, and McIntosh budded in August 1927 on understocks of Malling XVI, I and II, showed marked differences correlated with the understock. Trees on French crab as checks made the largest trees in three of the five varieties and Malling XVI in the other two. Malling I understocks produced the smallest trees in

all five varieties. As shown by the coefficient of variability of the cross section area of the trunk, the French crab lot started out much more uniform than the others but has become gradually only slightly less variable than Malling I trees, which were highly variable at planting. Rhode Island Greening and Melba, the only scion varieties to produce appreciable amounts of fruit, were most productive on Malling II. Observations on trees on Malling IX propagated at the same time and planted nearby showed worthwhile yields of nicely colored apples.

Soil variation and its relation to winter killing of roots of young apple trees, L. P. BATJER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 230–233, fig. 1*).—To ascertain the cause of irregular root killing in a large orchard of 4-year-old McIntosh, Delicious, and Cortland apple trees at Kinderhook, the [New York] Cornell Experiment Station collected samples of soil from beneath 42 living and 42 dead trees of the same varieties. Organic matter, determined by the ignition method, was consistently higher beneath the living tree of each pair. Nitrogen determinations on a portion of the samples showed approximately the same rank in organic matter as that determined by ignition loss. Moisture equivalents varying from 19.08 to 11.11 in 14 samples also checked very closely with the percentage of loss on ignition. The author believes that the wide difference in moisture-holding capacity observed must be reflected in plant response.

The influence of various depths of planting upon fruit trees [trans. title], S. ZIOBROWSKI (*Rocz. Nauk Ogrodnicz. (Ann. Sci. Hort.), 1 (1934), pp. 185–193; Ger. abs., pp. 192, 193*).—Winter Gold Pearmain apples worked on the usual understocks were planted in sand, loess, and loam soils at 10, 20, and 30 cm deeper than usual. After 4 yr. the trees were dug, and it was found that on the whole the trees had endured deep planting very well, suffering the least injury in the sand and the most in the heavy loam. *It is concluded that on a dry and light soil moderately deep planting of this variety may be actually beneficial.*

The effect of moisture extremes upon fruit trees, M. J. DORSEY (*Ill. State Hort Soc. Trans., 68 (1934), pp. 437–448, fig. 1*).—Presenting data on summer rainfall in southern Illinois orchards during past years, the author points out the frequent occurrence of critical droughts, discusses the effects of drought and also excess moisture on apple trees and apple fruits, and points out the desirability of wide spacing of permanent trees as a need in meeting their moisture requirements when full growth is reached. Wide spacing also permits leaving filler trees longer without injuring the permanent plantings.

The effect of pruning on growth and production of young apple trees. V. W. KELLEY (*Ill. State Hort. Soc. Trans., 68 (1934), pp. 416–423*).—This is a short discussion in which the author sets forth tabulated data to show that pruning reduces the growth of individual branches and of entire young trees and retards the onset of bearing as well as cutting down early production. However, the importance of early pruning in the development of a strong, permanent framework for young apple trees is stressed.

Recent experiments on spray residue removal, F. L. OVERLEY and E. L. OVERHOLSER (*Better Fruit, 30 (1935), No. 1, pp. 3, 4*).—Studies carried on by the Washington Experiment Station in commercial packing houses in Hood River, Oreg., and in Yakima and Wenatchee, Wash., indicated that apples sprayed with lead arsenate in combination with a soap spreader, lead arsenate and mineral oil, and fish oil emulsified with oleic acid or sodium silicate, or lead arsenate and kerosene soap, may be effectively cleaned of residues with the better flood or agitation types of the commercial tandem washers using either sodium

silicate or hydrochloric acid washing solutions. The single type washing machines did not appear to be effective in removing lead residues to the 0.018 grain per pound of fruit tolerance.

Physiological behavior of Grimes Golden apples in storage, P. L. Harding (*Iowa Sta. Res. Bul. 182 (1935), pp. 313–352, figs. 11*).—In respiration experiments with Grimes Golden apples stored at different temperatures it was found that respiratory activity is reduced to a minimum at temperatures such as 30° F. When the temperature was alternated between 50° and 30° the respiration rate followed closely. There was, however, no stimulation or depression in respiration rate beyond the point of fruits held constantly at the two temperatures. The life of fruits was prolonged by placing them in storage immediately after picking; in fact, the respiratory activity of apples just at the time of placement in storage served as an index to their storage capacity, particularly with reference to soggy breakdown. At a temperature of 50° apples from high nitrogen plats respired consistently more than did fruit from check plats. At 30° and 36° previous soil treatments were masked by the low temperatures. A higher percentage of soggy breakdown developed with deferred storage of fruit from the high nitrogen treatment than in that from the check plats.

Determinations upon Grimes Golden apples stored at different temperatures showed no consistent correlation between respiratory intensity and catalase activity. At 50° catalase activity was apparently associated with respiration, whereas at 30° and 36° no parallelism was observed. Fruits from nitrated trees showed greater catalase activity than did comparable lots from untreated trees. Catalase activity was considered an indication of physiological activities within the fruit, and under cold storage conditions an increase in this activity is a fairly accurate index to the approach of soggy breakdown. Oxidase activity, on the other hand, was not found to be significant as an indicator of the development of this disorder. In the case of deferred storage fruit held at 30° and 36° and of immediately stored fruit held continuously at 50°, catalase activity was more pronounced in the 30° lot than at the other two temperatures.

Influence of different quantities of moisture in a heavy soil on rate of growth of pears, M. R. Lewis, R. A. Work, and W. W. Aldrich (*Plant Physiol., 10 (1935), No. 2, pp. 309–323, figs. 5*).—In this study, conducted near Medford, Oreg., by the Oregon Experiment Station and the U. S. Department of Agriculture, there are presented observations in three orchards, one of Bartlett and two of Anjou, all on *Pyrus communis* roots. There was noted a very close correlation between moisture and rate of growth in all cases. Under the obtaining conditions, the growth of the fruits was reduced whenever the soil moisture dropped below 70 percent of the available capacity. The authors suggest that in the particular soil the actual moisture content adjacent to a portion of the active roots may possibly be down to the wilting point even though samples of soil taken in the general root zone may be well above the wilting point. The moisture supply may thus be determined not by the rate at which roots can take up water but by the rate at which the water can move through the soil to the roots. It was apparent that the growth of pear fruits may be influenced by comparatively small variations in soil moisture even when water is above the wilting point.

Influence of the size of seedling pear on the development of the scions [trans. title], **W. Gorjaczkowski** (*Roczn. Nauk Ogrodnicz. (Ann. Sci. Hort.), 1 (1934), pp. 121–131; Fr. abs., p. 131*).—Measurements of the growth of Comice and Clapp Favorite pear trees worked on seedling stocks of different sizes

showed that most of the trees ready for sale in their third year after budding were those on seedlings with diameters more than 10 mm, height more than 60 cm, and with weights of the part cut away above 20 g.

Pollination of the pear in Ohio, F. S. HOWLETT (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 84–89, figs. 5*).—Bartlett, Seckel, and Gorham pears were not found sufficiently self-fruitful to warrant planting without provision for cross-pollination. Bartlett and Duchess d'Angouleme proved effective pollinisers for Gorham. For Seckel, Bartlett pollen was ineffective, but Duchess d'Angouleme was fully satisfactory. Gorham and Duchess d'Angouleme pollinated Bartlett effectively, but Seckel was ineffective. The Bartlett-Seckel combination was thus undesirable in both directions. Planting plans are presented and instructions given for topworking and for introducing bouquets of compatible flowers and insects to facilitate pollination.

A succession of pear varieties for local and distant markets, S. JOHNSTON (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 108–113, figs. 3*).—The varieties discussed include Wilder Early, Elizabeth, Clapp Favorite, Bartlett, Seckel, Conference, Beurre Bosc, Dana Hovey, and Kieffer.

The Campas pear, H. G. GOULD and S. JOHNSTON (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 155–157, fig. 1*).—A brief account is given of the origin and characteristics of a Kieffer-like pear, inoculation tests of which have shown a high degree of resistance to bacterial blight.

The Gorham pear, F. S. HOWLETT (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 90–92, fig. 1*).—Descriptive notes are presented on this variety, originated by the New York State Experiment Station and found promising under Ohio conditions. Ripening later than Bartlett and possessing much of the high quality of this variety, Gorham is particularly useful in extending the season.

Investigations on delayed harvesting of Elberta peaches, R. L. MCMUNN and M. J. DORSEY (*Ill. State Hort. Soc. Trans., 68 (1934), pp. 491–502, figs. 3*).—Measurements taken by the Illinois Experiment Station on tagged fruits in an 11-year-old Elberta orchard, the trees of which had been thinned and were carrying a good crop, showed suture diameters of 58.12 mm on the day of commercial harvest, and 59.62, 61.17, and 62.53 mm 2, 5, and 7 days later, respectively. This was an actual gain of 24.4 percent in volume in 7 days. More important yet was the improvement in grade, from 47.8 percent fruits above 2.25 in. on the day of the regular harvest to 93.7 percent 7 days later. Color and quality were also materially improved in the 7 days. As recorded by the pressure test, the fruits were still firm enough on the final day to be shipped to distant markets if handled properly. When stored, the fruits of the four pickings lost weight at about the same rate. That of the final harvest was most attractive after storage and, although least resistant to the pressure test, could have been held for 3 or 4 days.

Since rainfall conditions were very favorable to a rapid final swell, observations are presented from another experiment where hot and dry weather prevailed. Here the maximum volume gain from delayed picking amounted to 20.7 percent, almost equal to that of the first experiment. The removal of part of the fruit at regular harvest did not have the beneficial size stimulus on the remaining fruit that was secured by regular thinning operations.

A study of some unproductive sports of the Montmorency cherry, V. R. GARDNER (*Jour. Agr. Res. [U. S.], 50 (1935), No. 5, pp. 457–478, figs. 7*).—Field observations by the Michigan Experiment Station in a large number of commercial Montmorency orchards, supplemented by detailed records on individual trees, showed a rather wide-spread occurrence of unproductive bud sports. This paper presents detailed descriptions of some of the more distinctive

aberrant forms, grouping them as follows: (1) Those failing to form any flower buds visible to the naked eye in positions where flower buds are usually differentiated, (2) those on which leaf buds occur in positions where flower buds are ordinarily formed, (3) those showing marked susceptibility of flower buds to injury from low temperature while in a dormant condition, (4) those showing marked susceptibility to injury from less severe temperatures while in delayed dormant or early post-dormant condition, (5) those showing marked susceptibility of flower buds or opening flowers to spring frost, and (6) those characterized by poor fruit setting. The occurrence of entire trees of off-type form is believed to be the result of propagating with buds taken inadvertently from off-type limbs. Variants producing light yields are said to be more of a problem than almost completely barren types because they are less evident and may, in fact, in certain favorable years bear almost normal crops.

Effect of fertilizer and mulch on yield of red currants, J. S. Shoemaker (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 82, 83*).—Except in one instance no increase in yield was obtained from either potash or phosphorus applied to Wilder red currants. The one exception was where superphosphate was applied with stable manure mulch, and the author concludes that the benefit was more likely from the mulch than from the phosphorus. This plat produced the highest yields of all treatments. Straw applied alone resulted in lower yields than the controls. Nitrogen was apparently the limiting element in yields under Ohio conditions.

Raspberry nutrition.—I, Seasonal variation of plant nutrients in raspberry plantings under different cultural treatments, G. H. Harris and J. J. Woods (*Sci. Agr., 15 (1935), No. 8, pp. 525–534; Fr. abs., p. 534*).—Studies of the solutions extracted from soil samples gathered at frequent intervals throughout the year in fertilizer and cultural plats of Cuthbert raspberries at the Dominion Experimental Farm, Agassiz, B. C., showed a well-defined seasonal trend in many of the constituents. Nitrates, for example, were high in May and September and low in March and July. Fertilizers, manures, and nitrogen applications tended to maintain a higher concentration of nitrates during the low July period. With phosphates there was observed no well-defined seasonal trends, while for potash the same trends were noted as for nitrates. A spring application of nitrate of soda did not appreciably increase the nitrates in the soil solution but did increase the available potash and to some extent the magnesium. Apparently the sodium from nitrate of soda replaced potash in in the solid phase of the soil. Calcium attained a maximum in May, with a progressive decline from there on. In general, acidity decreased during the summer, more beneath cover crops than in the open and less under rye than under clover or vetch. The rapid leaching in winter of all nutrients suggested the desirability of winter cover crops in the wet, mild climate that prevails in British Columbia.

Breeding strawberries for a particular ripening season, J. H. Clark (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 416–419*).—In breeding experiments at the New Jersey Experiment Stations involving a large number of crosses between varieties of different seasons of maturity, it was found that reciprocal crosses produced seedlings of approximately the same maturing date. Early varieties crossed with early varieties gave mostly early seedlings, and, conversely, late crossed with late gave mostly late seedlings. Late crossed with early gave rise to midseason berries. In most of the crosses there were some seedlings of earlier or later maturity than the early or late parents. Records of progenies from selfing indicated that certain varieties tend to produce late-ripening seedlings, and thus self-pollination served roughly to indicate the

breeding capacity of the parent with relation to transmission of the time of ripening character.

Strawberry variety tests [trans. title], R. PATORSKI (*Rocz. Nauk Ogrodnicz. (Ann. Sci. Hort.), 1 (1934), pp. 231–259, figs. 6; Ger. abs., p. 259*).—Descriptions are presented for 40 varieties, many of which are commonly grown in Poland.

Investigations on runner and fruit production of everbearing strawberries, G. F. WALDO (*U. S. Dept. Agr., Tech. Bul. 470 (1935), pp. 16, figs. 7*).—Stating that everbearing strawberries are simply those varieties which are able to form fruit buds during long days and high temperatures, the author presents the results of runner and flower removal experiments with Progressive, Mastodon, and other everbearers grown with and without irrigation. It was found that runner production could be stimulated greatly by defloration, as much as 500 percent where continuous removal was carried out. Runner production was stimulated through July and August when the runners were removed as they appeared. However, if the first runners were permitted to root the removal of later ones was by no means as stimulating, indicating the dependence of the runner plants upon the parent.

Irrigation had a profound effect, for with this treatment practically as many runners were produced by plants from which no flowers were removed as by those deflorated to July 15, August 15, or even continuously. Even under irrigation flower and runner removal to July 15 increased decidedly the yields during the remainder of the season. With everbearers flower removal early in the season is considered essential for the production of fair-sized berries in the latter part of the season. Varieties differed in their fruiting habits, but there was a definite tendency for all to produce in cycles of high and low yields. With defloration up to July 15 there were two peaks of production; with defloration continued to September 1 there was only one. The potential value of the present varieties of everbearers in the latitude of Maryland is questioned, with the suggestion that breeding offers greater possibility of improvement than other practice, except irrigation.

The effect of rainfall during the picking season on size and yield of certain strawberry varieties, W. H. CHILDS (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 420–423, fig. 1*).—Daily records taken by the West Virginia Experiment Station on the size and yield of berries produced in a systematically arranged variety planting at Lakin indicated that certain varieties respond more markedly to rainfall than do others; for example, following a rain of 0.59 in. on June 5 Blakemore, Culver, Clermont, and Glen Mary showed notable increases in berry size, while others, such as Aberdeen, Fairfax, Dorsett, and Big Joe showed no such response.

Five strains of the Scuppernong variety of muscadine grapes, J. G. WOODROOF (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 384, 385*).—Briefly discussing the history of the Scuppernong grape, the author describes five distinct strains, which presumably have arisen by bud mutations and which differ considerably in time of ripening and other characters.

Winter injury to grape seedlings, R. WELLINGTON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 389–391*).—Observations at the New York State Experiment Station following the extremely cold winter of 1933–34 on 2,748 seedlings of fruiting age representing 145 crosses or selfs of different species and species combinations showed a tremendous variation in response to low temperatures, ranging from complete killing to no injury. As was expected, certain varieties imparted a higher degree of hardiness to their progeny than did others. Among favorable crosses in this respect were Fredonia × Worden and Ontario × Moore Early. Observations on other combinations indicated that Worden and Moore

Early were the important parental varieties in transmitting hardiness. A combination of *Vitis vulpina* and *V. labrusca* is suggested as a source of extreme hardiness. *V. vinifera*, on the other hand, tended to lack resistance.

The present status of gas storage research, with particular reference to studies conducted in Great Britain and preliminary trials undertaken at the Central Experimental Farm, Canada, C. A. EAVES (*Sci. Agr., 15 (1935), No. 8, pp. 542–556, figs. 2; Fr. abs., p. 556*).—Following a general review of gas storage studies in Great Britain and elsewhere, the author reports that pure nitrogen atmospheres had a very harmful effect upon strawberries held at 54° F. Raspberries lost their flavor in nitrogen at 32° but maintained a pleasing appearance. High concentrations of carbon dioxide were found to decrease sweating, softening, and mold growth, and to maintain a bright, attractive appearance in both strawberries and raspberries. However, there was developed a bitter flavor. A maximum of 10 percent carbon dioxide is suggested for raspberries, with 5 percent at 32° the optimum.

Further observations on frost injury to subtropical fruit plants, R. W. HODGSON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 227–229*).—A follow-up of earlier observations (E. S. R., 72, p. 627) on California trees injured by the severe freeze of December 1932 showed various degrees and kinds of injury. In some cases the cambium was injured without external evidence of bark injury, and in other cases there was marked discoloration of bark without evidence of cambial damage. Crotch injury to the walnut and severe killing back of citrus, olive, and fig trees were the major kinds of injury observed. The nutritional condition of the tree or plant at the time of the freeze appeared to be a very important determining factor as to the seriousness.

Some aspects of citrus decline in Arizona, W. T. MCGEORGE (*Calif. Citrogr., 20 (1935), No. 7, pp. 198, 214–216, figs. 2*).—The discovery by the Arizona Experiment Station of a third black alkali salt known as sodium clay and insoluble in water and difficult, therefore, to remove from the soil is discussed in relation to citrus decline. Possible means of reducing the alkalinity, such as introducing acids directly into the irrigation water or applying organic matter and sulfur, are considered, and actual trials with corn plants and young citrus trees are reported.

Juice of navel oranges in relation to soil fertilization, A. R. C. HAAS (*Calif. Citrogr., 20 (1935), No. 6, pp. 160, 172, 173*).—Examinations at the Citrus Experiment Station, Riverside, Calif., of the strained juice of samples of oranges harvested from the Rubidoux fertilizer plats showed fruits from nonitrogen plats to contain less total nitrogen in their juice than did fruits from plats receiving nitrogen, but the differences were not significant. Phosphorus and potash applications did not increase the content of these elements in the juice. Potassium chloride apparently did increase total chlorine content. Total sulfur was very uniform in the fruits of all plats. Approximately half the ash of the navel orange was found to consist of potash, with sodium present in only small amounts. The juice of fruits from trees fertilized with nitrate of soda showed the highest inorganic phosphorus content and the second highest calcium content.

Metaxenia in dates, R. W. NIXON (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 221–226, figs. 3*).—Applications of Fard No. 4 and Mosque pollens, which have been found to produce small early-ripening and large late-ripening dates, respectively, to Deglet Noor blossoms again showed definite responses related to the pollen parent. The weight difference for Mosque over Fard No. 4 ranged from 11.6 to 19.6 percent for the entire date and from 6.8 to 16.9 percent for the flesh alone. Since the size of dates may be regulated by thinning, modifica-

tions in the time of ripening are considered of much more commercial importance. In 1930 Deglet Noor palms pollinated with Fard No. 4 began ripening 15 days earlier than comparable trees pollinated with Mosque. Totals of 61 and 28 percent were harvested, respectivley, from the two groups in September. Comparable results were secured with Deglet Noor pollinated with Fard No. 4 and Cook No. 1.

The oil palm in Malaya, B. BUNTING, C. D. V. GEORGI, and J. N. MILSUM (*Kuala Lumpur: Govt., 1934, pp. [3]+IX+293, pls. 38*).—This contains general information on varieties, culture, pollination, control of pests, harvesting, and the preparation and marketing of products.

Coloring and fertilizing hydrangeas, G. H. POESCH (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 92–94*).—Aluminum sulfate applied seven times during the period January 14 to March 10, 1933, in liquid or in dry form was found effective in lowering the pH of the soil. When the pH reached 6 or lower bluing of the flowers resulted in the Goliath variety, whereas Gertrude Glahn blooms took on a dark lavender hue. Experiments in 1934 with more varieties showed that the effects of lowering pH varied decidely with varieties, Goliath and Blue Prince responding most favorably. The lowering of the pH proved to be a slow and gradual process. Varieties naturally medium pink in color produced a better blue than did dark pink varieties. Slight injury resulted from aluminum sulfate when the acidity was increased to pH 4. In fertilizer trials ammonium sulfate produced the largest flowers. Blood and bone and bone alone produced smaller plants and flowers than did ammonium sulfate or complete mixtures.

Influence of planting time and forcing temperatures upon the rate of development of tulips and hyacinths [trans. title], S. WÓYCICKI (*Rocz. Nauk Ogrodnicz.* (*Ann. Sci. Hort.*), *1 (1934), pp. 133–141, figs. 2; Ger. abs., p. 141*).—The results showed that the later the planting the later the time of flowering. Although delays in planting delayed flowering, the differences were relatively small in the different lots of plants because of the fact that the later plantings developed at a more rapid rate.

Rock plants that resist cold, heat, and drouth, F. H. BALLOU (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 96–98, fig. 1*).—Lists are presented of plants which survived satisfactorily and those which perished during the severe winter and summer seasons of 1933–34.

Weather-proof labels for rock plants, F. H. BALLOU (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 94, 95, fig. 1*).—A description is presented of a type of label which consists simply of a slip of paper inserted into a small glass phial.

FORESTRY

Management of American forests, D. M. MATTHEWS (*New York and London: McGraw-Hill Book Co., 1935, pp. XV+495, figs. 22*).—This book deals with practical problems of management of forest property both from the technical and the financial viewpoints.

[Forestry studies by the Michigan Station] (*Michigan Sta.* [*Bien.*] *Rpt. 1933–34, p. 38*).—Brief mention is made of studies on the relation of forest growth to soil types and on improvements in nursery practice.

[Forestry investigations by the Ohio Station] (*Ohio Sta. Bul. 548 (1935), pp. 102–113, figs. 4*).—Included in the report are the results of emergency conservation activities, by E. Secrest; work in the State forests, by O. A. Alderman; erosion control with forest species, by N. R. Bear, Easton, and Bell; reforestation activities, by Secrest, forest fire control, by B. E. Leete, and forest land classification, by R. R. Paton.

The accumulation and rate of melting of snow as influenced by vegetation, C. A. CONNAUGHTON (*Jour. Forestry, 33 (1935), No. 6, pp. 564–569*).—Three years' observations on the Boise River watershed in central Idaho on the accumulation and rate of melting of snow on five plats representing distinctive types of vegetable cover, ranging from complete denudation to virgin timber with a dense stand of advance reproduction, showed that the average annual interception reached a maximum of 29.8 percent of the total winter precipitation on the virgin timber with advance reproduction plat, assuming the denuded area to be normal. Small openings between trees were almost as effective in snow accumlation as were large open areas, the effect of the tree crowns being confined apparently to the area directly beneath. As determined by measurements of water content of the snow, dense crown covers have material influence in retarding the rate of melting. The importance of advance reproduction was shown in the fact that all snow disappeared from the plat having mature timber without reproduction 5 days earlier than from the two forested plats. The lessening effect of advanced reproduction on wind movement is believed a potent factor in retarding the rate of melting. Soil temperatures beneath snow were found constant at each location and constant throughout the period of melting. Thereafter the temperature of the soil rose more rapidly on the denuded area.

Photoperiodism in forestry, S. R. GEVORKIANTZ and E. I. ROE (*Jour. Forestry, 33 (1935), No. 6, pp. 599–602*).—A brief review is presented of the results of investigations conducted in Russia on the influence of shortening day lengths on the growth of seedlings of maple, alder, hazel, ash, walnut, pine, locust, willow, elm, and other forest species. Among important findings was that abbreviated day length increased resistance to low temperatures, particularly in species brought from more southerly points.

Effects of environment upon the root habits of certain deciduous forest trees, H. H. BISWELL (*Bot. Gaz., 96 (1935), No. 4, pp. 676–708, figs. 14*).—Data are presented by the University of Nebraska on the root development of first-year seedlings of eight species of forest trees grown part in the open and part under lath frames in loess, clay, and alluvial soils. Observations were also made on the root systems of older saplings in the general vicinity.

Partial shade favored the growth of black walnut, buckeye, red oak, shagbark hickory, and hard maple but retarded that of honeylocust, boxelder, and sycamore. The root systems in all species were deeper and more branched where the seedlings grew in full sunlight. Transpiration was higher in all cases in the open, ranging from 20 percent in boxelder to 250 percent in hard maple. With the exception of the oak, roots penetrated most deeply in the loess soil. Apparently because of deficient aeration in spring, early root development was retarded in the alluvial soil.

Bark thickness (*Jour. Forestry, 33 (1935), No. 6, pp. 624–626*).—Measurements on 10 species of Pennsylvania forest trees of the thickness of the bark at breast height and at 1 ft. above the soil level showed wide differences among trees of the same diameter. The bark of pines (Virginia, mountain, and pitch) was almost twice as thick as that of oaks, maple, and black locust. With all species bark thickness increased with the diameter of the trunk. The thinnest bark, found in red maple is said to be correlated with a recognised susceptibility to forest fire injury.

Seasonal variations in the germination of red spruce, H. I. BALDWIN (*Amer. Jour. Bot., 22 (1935), No. 3, pp. 392–394, fig. 1*).—Monthly germination tests under controlled laboratory conditions of samples taken from a single lot of seed stored in a spring top can at about 20° C. (68° F.) showed no marked

periodicity during the 20 mo. in which it was possible to continue the trials. Germination was consistently higher in light than in darkness. At the end of the 20 mo. germination was still high in both environments.

Natural spreading of planted black locust in southeastern Ohio, J. A. LARSEN (*Jour. Forestry, 33 (1935), No. 6, pp. 616–619, fig. 1*).—At the instance of landowners worried by the persistent spread of black locust trees planted to control erosion, studies were made in the summer of 1934 on the rate and manner of root spread. The minimum spread was 3.3 ft. per year and the maximum 10 ft. Heavy grazing and cultivation tended to slow down the spread, and such factors as site, exposure, gradient, soil condition, and soil composition were also involved. The wounding of roots was not found essential to the formation of suckers.

Growth in a selectively logged stand in Louisiana bottomland hardwoods, V. B. DAVIS (*Jour. Forestry, 33 (1935), No. 6, pp. 610–615*).—Records taken in the fall of 1933 on the growth of the remaining trees in a stand in St. Landry Parish, La., selectively logged in the winter of 1925–26 revealed an annual net growth of 175 bd. ft. per acre during an 8-yr. period. Because of the severe droughts that occurred during the period, causing considerable mortality, the results are not considered representative of the full possibilities of improvement after selective cuttings.

Artificial pruning in coniferous plantations, R. C. HAWLEY and R. T. CLAPP (*Yale Univ. School Forestry Bul. 39 (1935), pp. [4]+36, pls. 10*).—For the most part a discussion of the policies and practices of pruning employed in the coniferous plantings in the Eli Whitney Forest, this paper presents certain data on the comparative quality and rapidity of pruning as accomplished with pole saws and with regular equipment from a ladder, and also on the costs and financial aspects of pruning forest trees.

Forest fire damage studies in the Northeast.—II, First-year mortality in burned-over oak stands, P. W. STICKEL (*Jour. Forestry, 33 (1935), No. 6, pp. 595–598*).—Observations a year later on plats established in two burned-over New York forests showed that in forests in which oaks dominate the stand a high percentage of mortality may be expected, particularly of smaller trees. The mortalities, amounting to 27 and 47 percent, were influenced materially by the type of ground cover. Since all of the trees were alive 5 to 6 mo. after the fires, it was evident that at least one growing season must elapse before reliable mortality data can be taken.

Effect of weathering upon dry matter and composition of hardwood leaves, H. A. LUNT (*Jour. Forestry, 33 (1935), No. 6, pp. 607–609*).—Further data (E. S. R., 70, p. 485) taken by the Connecticut Experiment Station on the loss of certain materials from weathered leaves of beech, maple, shagbark hickory, dogwood, and oak trees showed a lower percentage of losses of P and K, due apparently to the lesser precipitation. Losses of P and K were greatest in beech leaves and in the case of P least in hickory leaves. Changes in Ca and N were relatively small. Calculated on the basis of amounts present in unweathered leaves, the loss in dry matter was greatest in red maple and dogwood and least in beech and oak.

DISEASES OF PLANTS

The Plant Disease Reporter, April 15, May 1, May 15, June 1, June 15, and July 1, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), Nos. 5, pp. 39–66; 6, pp. 67–93, figs. 59; 7, pp. 94–111, fig. 1; 8, pp. 112–136, figs. 4; 9, pp. 137–147, figs. 2; 10, pp. 148–155*).—Among other items of current interest, these issues contain the following:

No. 5.—The Ascomycetes of Mississippi, by L. E. Miles, listing 1,079 collections representing 132 genera and 325 species.

No. 6.—Experimental forecast of the incidence of bacterial wilt of corn in 1935, by N. E. Stevens; fungi in imported corn (including *Diplodia zeae* and *Gibberella* from Argentina, Manchuria, and Mexico), by Stevens and P. E. Hoppe; and incidence of ear rots in the 1916 to 1933 corn crops, by Stevens.

No. 7.—*Gonatorrhodiella parasitica* on *Trichoderma lignorum*, by R. W. Davidson; notes on some diseases of ornamentals (*Gloeosporium* on leopard plant and gerbera and *Botrytis* spot on gerbera leaves), by T. B. Post; influence of potash-deficiency rust upon the yield and quality of cotton, by W. H. Rankin and J. H. Moore; leaf spots (*Sclerotinia sclerotiorum* and *Cercospora* sp.) on *Melilotus indica*, by J. L. Weimer; and the relative prevalence and distribution of the *Verticillium* and *Fusarium* wilts of tomato in Utah and their possible relationship to sunscald of tomato fruit (1934 survey), by H. L. Blood.

No. 8.—An attempted analysis of the economic effects of cranberry diseases, by Stevens; and *Anguillulina dipsaci* (leaf and stem nematode) in imported *Galtonia candicans* (bulbs from the Netherlands), by B. J. Hastings.

No. 9.—Bean and pea diseases in some of the Western States in 1934, by L. L. Harter and W. J. Zaumeyer.

No. 10.—Misleading, unproven reports of *Graphium ulmi* on the Burbank plum, by M. A. Clarke and R. K. Beattie; leaf variegation of the Blakemore strawberry; and *Gloeosporium* on *Rhodotypos*, by L. R. Tehon.

[Plant diseases in Arizona] (*Arizona Sta. Rpt. 1934, pp. 54, 55–57, 77–84, 85, 86–88, figs. 6*).—Brief reports are included of progress made on the following investigations: Zinc treatment for pecan rosette; control of citrus chlorosis and decline by ferric citrate and other treatments; the causes and prevention of mottle leaf, "crazy top", and other forms of physiological disturbances in Arizona plants; the reduction of spotting of leaves and fruit rot of date by bordeaux mixture spray; sulfuric acid treatment of seed for the control of angular leaf spot of cotton; the use of ammonium sulfate and ammonium hydrate for the control of Texas (cotton) root rot in deciduous orchards; the testing of crop and ornamental plants for resistance to Texas root rot; the inhibition of the cotton root rot fungus by the fungus *Trichoderma lignorum*; a bacterial disease (*Phytomonas holcicola*) of milo maize new to Arizona; a stalk rot disease of hegari due to an unidentified fungus; the effect of copper compounds on bunt of wheat; cotton wilt (possibly Waxahachie wilt); rhizoctoniose of strawberry; root knot nematode control by the use of disease-resistant crops and dry fallow; and *Thielaviopsis paradoxa* heart rot of palms.

[Fruit disease studies in Louisiana], A. G. PLAKIDAS (*Louisiana Sta., Fruit and Truck Sta. Rpt. [1934], pp. 4–10*).—Brief summaries are given of the results of investigations conducted in 1933 and 1934 as follows: Comparison of the efficacies of standard and "instant" bordeaux mixture for the control of strawberry leaf blights (*Diplocarpon earliana* and *Mycosphaerella fragariae*), the mode of action of bordeaux spray on the strawberry leaf spot fungus (*M. fragariae*), seed transmission of yellows or leaf variegation of the Blakemore strawberry, varietal resistance of strawberry to leaf blights, the association of fungi of the *Botryosphaeria-Sphaeropsis* group with the dying of Pineapple pear trees, and the nature and control of rosette due to *Cercosporella* sp. on dewberries and blackberries.

[Plant disease studies in Maine] (*Maine Sta. Bul. 377 (1934), pp. 349–350, 381–384, 389–391, 393–395, figs. 5*).—The results are reported of progress on the following investigations: The relative value of bordeaux mixtures containing

different amounts of lime, comparison of high-magnesium v. high-calcium lime in bordeaux mixtures, and comparison of bordeaux mixture with colloidal copper, basic copper sulfate, copper-lime dust, and basic copper-lime dust for potato spraying, all by R. Bonde; the determination and control of potato virus diseases, including latent mosaic, mild mosaic, leaf-rolling mosaic, rugose mosaic, streak, leaf roll, yellowtop, and spindle tuber, by Bonde and D. Folsom, in cooperation with the U. S. D. A. Bureau of Plant Industry; effects of lead arsenate, dry lime-sulfur spray, flotation sulfur spray, and sulfur dust on trees used for apple scab control tests, by Folsom; and comparison of copper-lime v. sulfur dusts in control of diseases of the blueberry, and testing for varietal resistance to bacterial wilt [*Aplanobacter stewarti*] of sweet corn, both by F. L. Markin.

[Plant disease studies in Michigan] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 17, 18, 19*).—Results of the following studies are briefly summarized: The control of hollow heart of potato by cultural practices, the control of fire blight by zinc chloride treatment, soil conditions and treatment methods in relation to gladiolus scab and dry rot, breeding for resistance to snapdragon rust, rose mosaic in the Ragged Robin variety, the further selection of celery for resistance to Fusarium yellows, forms of celery mosaic and their transmission by cotton and celery aphids, tomato breeding for resistance to Fusarium wilt, soil and tuber treatments with sulfur and mercurials for potato scab and Rhizoctonia prevention, yellow dwarf of potato and its transmission by grafts and by leaf hoppers and aphids, the effectiveness of seed treatment for seedling blight of corn in relation to soil temperatures, experiments with dusts and dips for wheat stinking smut control, and the susceptibility of the earliest maturing varieties to bacterial wilt of sweet corn.

[Plant disease studies in New Hampshire] (*New Hampshire Sta. Bul. 284 (1935), pp. 13, 15, 16, 22*).—Brief record is made of the results of studies on the extent and nature of lime-sulfur injury on apples, potatoes, and beans and the influence of weather and of added chemicals thereon, the effect of fertilizers, of hay mulch, and of date of harvesting on the development of bitter pit in apples, and the effect of different temperatures on the symptoms and effects of potato mosaic and potato leaf roll, all by O. Butler; of spraying experiments with calcium monosulfide, lime-sulfur solution, and flotation sulfur on apples and studies on apple scab ascospore discharge in New Hampshire, by Butler and S. Dunn; and of studies on seed and soil infection in foot rot of peas and pea seed disinfection trials, by J. R. Hepler.

[Plant disease studies in Ohio] (*Ohio Sta. Bul. 548 (1935), pp. 32–34, 36–38, 48, 49, 113, fig. 1*).—Brief summaries are given of the results of work done during 1933–34 on the following: The insoluble coppers as substitutes for bordeaux mixture and sticker materials for insoluble copper compounds, both by H. C. Young; survey of tomato varieties for resistance to *Septoria* leaf spot and breeding for a new leaf mold resistant tomato variety, both by L. J. Alexander; tests of bordeaux mixtures with low lime content in potato spraying, gladiolus corm treatment with Calogreen and corrosive sublimate for the control of scab, and bacterial fasciation of sweet peas, all by P. E. Tilford; cucumber treatments with sprays and dusts of copper compounds of low solubility and other materials in relation to growth, yield, and bacterial wilt [*Bacillus tracheiphilus*] control, by J. D. Wilson; a bacteriophage in relation to Stewart's disease [*Aplanobacter stewarti*] of sweet corn, by R. C. Thomas; new cases of the Dutch elm disease in Ohio, by R. U. Swingle; testing of spray formulas and materials for the control of apple scab, by I. P. Lewis; and spread of white pine blister rust in Ohio, by [O. J.] Dowd.

[Plant disease research] (*Jour. Southeast. Agr. Col., Wye, Kent., No. 35 (1935), pp. 17–32, figs. 2*).—Brief reports are given of the results of investigations conducted at the South Eastern Agricultural College in 1933 and 1934 as follows: A survey of general plant diseases during the year, the downy mildew of the hop (*Pseudoperonospora humuli*), spraying experiments with cottonseed oil-bordeaux emulsion against apple scab and pear scab, virus diseases of the hop, including chlorotic disease, split-leaf blotch, nettlehead, and a new mosaiclike disease of the Fuggle, and a study of resistance of hop varieties to mold (*Sphaerotheca humuli*), all by E. S. Salmon and W. M. Ware; and "marsh spot" in pea seed, by B. S. Furneaux and H. H. Glasscock.

A descriptive key for plant viruses, J. Johnson and I. A. Hoggan (*Phytopathology, 25 (1935), No. 3, pp. 328–343*).—In this contribution from the Wisconsin Experiment Station, the need is emphasized for a more systematic description of plant viruses as an aid to subsequent identification. It is believed that descriptions should be based on the characters of the virus itself rather than on the resultant disease. The following characters of a virus are regarded at the present time as of greatest value for diagnostic purposes: Modes of transmission, including the identity of any known insect vector; natural and differential host plants; longevity in vitro, thermal death point; and certain distinctive or specific symptoms.

Using these features as criteria, the authors have developed a tentative scheme for a descriptive key to plant viruses, in which the main subdivisions are determined by the modes of transmission, i. e., transmissibility by different groups of insects, by plant extract, and by grafting. About 50 known viruses have thus been placed in the key, and these fall into several fairly well defined groups. The suggestion is made that these groups bear a certain natural relationship to one another, and that further study of such relationship may lead to a more natural scheme of classification.—(*Courtesy Biol. Abs.*)

Studies on certain physiological characters of Phytomonas tumefaciens, Phytomonas rhizogenes, and Bacillus radiobacter, I, II (*Jour. Bact., 28 (1934), No. 6, pp. 571–618, figs. 6*).—These studies were carried on at the Wisconsin Experiment Station.

In part 1, by H. E. Sagen, A. J. Riker, and I. L. Baldwin (pp. 571–595), a physiological comparison is made of the crown gall organism *P. tumefaciens*, the hairy root organism *P. rhizogenes*, and a soil saprophyte resembling the former, *B. radiobacter*, with emphasis on their nitrogen and carbohydrate metabolism.

"In these studies cultures obtained from both colony isolation and single-cell origin were employed. Organic and inorganic compounds containing nitrogen were utilized, as shown by growth, as sources of nitrogen by *P. tumefaciens* and *B. radiobacter*. Amino acids were utilized to about the same extent by *P. tumefaciens* and *B. radiobacter*. Amino acids singly or in a mixture and inorganic sources of nitrogen were utilized little if at all by *P. rhizogenes*. Nitrate nitrogen was utilized by *P. rhizogenes* to a very limited extent where a reducing agent was employed. Nitrates were reduced to a very small extent by *P. tumefaciens*, but completely by *B. radiobacter* when certain carbon sources were employed. They were reduced more quickly by *B. radiobacter* in a medium containing both nitrate and peptone than in a medium containing nitrate but no organic nitrogen compounds. Glucose potato-extract was one of the most favorable mediums for the growth of *P. rhizogenes*. Where various carbohydrates, glucosides, alcohols, and organic acids or their salts were utilized by *P. tumefaciens* and *B. radiobacter*, they were used to about the same extent as indicated by growth, but with some differences in final reaction. All three

types of organisms when grown in potato-extract glucose medium reduced the potential of the medium to about the same extent, whereas when grown in a glucose nitrate medium, in a glucose nitrate peptone medium, and a glucose peptone medium, they showed considerable difference with respect to the potentials induced. Oxidation-reduction potentials determined over a period of time help to account for quicker reduction of nitrate when peptone was added to the medium."

In part 2, by A. A. Hendrickson, Baldwin, and Riker (pp. 597–618), studies were made with single-cell cultures of the three species on physiological differences and on variations within the same group under different conditions. The pathogenicity of all the cultures employed was studied in connection with their physiological behavior.

Differences in physiological behavior were noted in respect to: (1) Reduction of sodium selenite; (2) either absorption or bacteriostatic effects with dahlia, thionine, Bismark brown, and aniline blue; and (3) types of growth in several mediums in which oxidation-reduction potentials were varied. The oxidation-reduction potentials of a ferric-ammonium-citrate medium and of a mannitol aniline-blue medium were lowered in a similar manner by these organisms.

For isolations of cultures from crown gall, a yeast-water mannitol medium with aniline blue was found useful.

Variations in the physiological and pathogenic reactions of the 55 cultures were not obtained by continuous cultivation in artificial mediums. However, a nonpathogenic crown gall culture was secured by colony isolations from a single-cell parent.

Variations in the physiological behavior of the crown gall organism were obtained by plant passage. The variations observed involved (1) smooth and rough colonies, (2) reaction in KNO_3 glycerol phenol-red broth, (3) dye absorption in yeast-water mannitol aniline-blue medium, and (4) the formation of a serum zone in milk. Plant passage had no apparent effect upon the virulence of the crown gall organism.—(*Courtesy Biol. Abs.*)

The treatment of deciduous fruit trees and nut trees infected by Phymatotrichum omnivorum with ammonium compounds, R. B. STREETS (*Science, 79 (1934), No. 2053, pp. 417, 418*).—A preliminary account is given of the successful result of 2 years' experiments conducted by the Arizona Experiment Station with rather heavy applications of ammonium sulfate or ammonium hydrate diluted to a safe concentration with water and applied to the soil for the treatment of trees affected by the cotton root rot fungus. The ammonium hydrate is reported to be somewhat disagreeable to handle on account of its volatile nature but is considered probably better for treating very badly diseased trees. Outstanding success was met with in treating affected pecan trees in the Yuma Valley.

Relation of temperature to infection of bean and cowpea seedlings by Rhizoctonia bataticola, C. M. TOMPKINS and M. W. GARDNER (*Hilgardia [California Sta.], 9 (1935), No. 4, pp. 219–230, figs. 2*).—Cultures of *R. bataticola* isolated from sugar beet, bean, cowpea, sweetpotato, begonia, citrus, strawberry, and cotton, along with J. C. Haigh's A, B, and C strains, were used in the tests reported. All differed in cultural characters, even those from the same host. All except Haigh's A and B strains produced small sclerotia and were referred to Haigh's C group, *Macrophomina phaseoli*. None produced pycnidia.

The average daily rate of mycelial growth was measured at different temperatures. Rapid growth occurred at from 25° to 34° C., with the optimum at about 31°. The culture from citrus grew only about half as rapidly as the others, had a lower optimum temperature, and proved to be nonpathogenic.

Surface-sterilized Mexican Red bean and California Blackeye cowpea seeds were planted in cups in moist sand inoculated with the different strains and were germinated at 20°-23°, 25°, 28°, 31°, 34°, 37°, and 40°, respectively. High percentages became infected at 31°, 34°, and 37°, with considerable infection occurring at all temperatures. All the cultures were pathogenic except that from citrus and Haigh's A and B.

Except for the begonia culture, the cultures which were pathogenic to beans were also more or less so to cowpeas. The cowpea seedlings tended to escape infection with all except the culture from cowpea at 34°, 37°, and 40°, due perhaps to prompt and vigorous germination at these temperatures, but at 25° and 28° they were nearly as susceptible as the beans. Most of the infection of both beans and cowpeas occurred in the cotyledons.

R. solani proved pathogenic to the beans and cowpeas at the lower temperatures, and infected the cotyledons to a considerable extent.

Hybridization between Sphacelotheca sorghi and Sorosporium reilianum, L. J. TYLER and C. P. SHUMWAY (*Phytopathology, 25 (1935), No. 3, pp. 375, 376, fig. 1*).—It is reported that monosporidial lines of the two smut fungi mentioned were inoculated both singly and in paired combinations into sorghum plants. None of the single lines caused infection, but infection occurred on two lots of plants which had been injected with different combinations between monosporidial lines of the two species. Sori and spores appeared to be somewhat intermediate in type between those of the two original species. The appearance of the hybrid smut is illustrated by a photograph.

The use of oil-soluble copper as a fungicide, E. R. DE ONG (*Phytopathology, 25 (1935), No. 3, pp. 368-370*).—Copper fungicides are commonly applied as dusts or as sprays with water only as the carrier, both methods resulting in surface deposits of copper on leaves and twigs. Oil-soluble copper resinate, with a pine-tar oil as a carrier, was found to enter leaf and twig tissue as the oil penetrated. Thirty days after spraying with bordeaux, apricot and plum twigs showed 80 percent of the copper still present on the surface but no determinable amount within the twig tissue, while 30 days after spraying with copper resinate in a pine-tar oil 60 percent of the copper was recovered from the twig surface and 21 percent from within the twig tissue. The fungicidal value and physiological effects of the penetrating copper are not reported on.

Relation of Fusarium and Helminthosporium in barley seed to seedling blight and yield, J. J. CHRISTENSEN and E. C. STAKMAN (*Phytopathology, 25 (1935), No. 3, pp. 309-327, figs. 4*).—Barley grown in the Northwest is commonly attacked and frequently discolored by a large group of fungi and bacteria. In 1932 and 1933 *Alternaria* was by far the most prevalent organism isolated at the Minnesota Experiment Station from blighted seed. *Fusarium* and *Helminthosporium*, however, were the common virulent root-rotting organisms associated with diseased seed. In some regions barley was relatively free from seed blight in 1932, but severely discolored in 1933. There was a high correlation between percentage of seed infected with *Fusarium* and *Helminthosporium* and percentage germination of seed, stand, amount of root rot, seedling blight, the number of stunted or deformed plants, and discoloration of coleoptile.

The value of treating seed barley was found to depend on the degree of blighting in the seed, the variety of barley in question, and the fungicide used. With all varieties except Glabron, seed treatment with Ceresan increased yields unless the seed was virtually clean. The value of the treatment was directly proportional to the percentage of kernels infected with *Fusarium* and *Helminthosporium*. There appear to be distinct varietal differences in behavior of barley toward seed treatment, at least as far as yield is concerned.—(*Courtesy Biol. Abs.*)

Effect of crown rust infection on yield and water requirement of oats, H. C. Murphy (*Jour. Agr. Res. [U. S.], 50 (1935), No. 5, pp. 387–411, figs. 10*).—The results are given of studies conducted in 1928, 1930, and 1933 in cooperation with the Iowa Experiment Station concerning (1) the relation of the total duration of crown rust (*Puccinia coronata avenae*) infection to reduction in yield of a susceptible oat variety growing under field conditions, (2) the relation of the total duration of crown rust infection to yield and water requirement of a susceptible pure line and a resistant one growing under greenhouse conditions, and (3) the interrelations of soil moisture and time of initial infection with yield and water requirement of two susceptible lines and one nearly immune pure line under greenhouse conditions. Under field conditions there was evident a strong positive correlation between early initial infection and reduction in yield and weight per bushel of the grain (44.2 percent as much grain with early 100 percent infection as with the sulfur-dusted control). Early infection also retarded the date of heading.

Plants growing under greenhouse conditions were artificially inoculated in the seedling, boot, anthesis, and dough stages of development and the infection maintained until maturity. Observations were made on the effect of two physiologic forms of the rust organism on the yield of grain, roots, and straw, ratio of roots to straw, water consumption, and water requirement of infected and noninfected host plants. The loss in yield because of rust infection was much greater for the grain and roots than for the straw. Water requirement was greatly increased as a result of rust infection. The decrease in yield of the various plant parts and the increase in water requirement were in proportion to the duration and severity of the infection. Heavy infection initiated on a susceptible Markton selection in the seedling and boot stages completely inhibited development of grain, while infection initiated in the dough stage had no significant effect on the yield of any plant parts or on water requirement.

Crown rust infection had a greater effect on the yield and water requirement of the susceptible selections at the higher soil-moisture level. Lowering the soil moisture in itself significantly reduced the yield of all plant parts, although, with the exception of the resistant Bond selection, the effect was not so great as that caused by the rust infection.

Experimental infection of rye (Petkus) by wheat bunt, Tilletia tritici and T. levis [trans. title], R. Nieves (*Phytopathology, 25 (1935), No. 5, pp. 503–515; Eng. abs., pp. 513, 514*).—Preliminary studies indicated that the rare *T. secalis* does not occur in Argentina. In these tests the seed grain was dusted shortly before planting time with the spores of the particular smut collection being studied.

In 1931–32, 6 collections of *T. tritici* and 2 of *T. levis* were used, 2 sowings being made, April 23 and July 20. From the first planting, 68 infected spikelets were found in a total of 6,761 (approximately 1 percent), and from the second planting, 2 only were infected in a total of 8,667 (0.02 percent). In 1932–33, 18 collections of *T. tritici* and 6 of *T. levis* were used, plantings being made on April 27. Forty-nine infected spikelets were found in a total of 22,780 examined, or 0.22 percent. Of the smut collections used during the 2 yr., 4 of *T. tritici* and 3 of *T. levis* produced infection. During 1933–34, 43 collections of *Tilletia* were used. Preliminary results indicated further positive results.

In connection with these studies, the author established by the differential host method 9 physiological forms of *T. tritici* and 4 of *T. levis*. Of the forms of *T. tritici*, only 3 were found to infect rye.

A leaf spot of bent grasses caused by Helminthosporium erythrospilum, n. sp., C. Drechsler (*Phytopathology, 25 (1935), No. 3, pp. 344–361, figs. 7*).—A

leaf spot, found to occur widely on redtop, *Agrostis alba*, in some Eastern and Middle Western States, is described. It is reported also on seaside bent, *A. palustris*, and on colonial bent, *A. tenuis*, and is compared with the less injurious *H. triseptatum* leaf spot. The conidia are typically straight cylindrical, rounded abruptly at both ends, distinctly yellowish, and 25μ to 105μ by 8μ to 16μ. It is referred to the series having ascigerous connections in *Pyrenophora* and is described, with Latin diagnosis, as a new species, and distinguished from various other members of that series.

Dissemination of southern celery-mosaic virus on vegetable crops in Florida, F. L. WELLMAN (*Phytopathology, 25 (1935), No. 3, pp. 289–308, figs. 6*).—The southern celery mosaic virus (celery virus 1) was found to spread in a generally characteristic manner in fields of squash, pepper, celery, and sweet corn, and in the weeds *Commelina nudiflora* and *Ambrosia elatior*. It usually started at the field edge near an infection source (diseased weeds or crop plants) and spread inward through the successive development of small scattered coalescing areas. Further infection and widely dispersed centers of disease might develop until the whole field was involved. Although there was some spread through mechancial means, in celery large increases were observed to be dependent upon the occurrence of large numbers of the aphid vector, *Aphis gossypii*. In sweet corn the disease spread only during the seedling stage. The most rapid spread was found in squash fields.

A bacteriophage in relation to Stewart's disease of corn, R. C. THOMAS (*Phytopathology, 25 (1935), No. 3, pp. 371, 372*).—In work at the Ohio Experiment Station, a bacteriophage was found associated with *Aplanobacter stewarti*. Isolations of the phage have been made from dead corn plants, infected seed, and from infected plants which were recovering. The action of the phage produced in the corn wilt bacteria physiological changes such as loss of yellow color, increase or decrease of viscosity of bacterial growth, and reduction or loss of virulence. Naturally infected seed treated with phage filtrate showed a marked reduction in disease (1.4 percent infection) when compared with untreated check plats (18 percent infection). It is suggested that a bacteriophage may be an important biological factor in preventing more serious losses from Stewart's disease.—(*Courtesy Biol. Abs.*)

Cotton anthracnose in the Central Provinces, J. F. DASTUR (*Indian Jour. Agr. Sci., 4 (1934), No. 1, pp. 100–120, pls. 2, figs. 3*).—Distinguished from *Glomerella gossypii* by having shorter conidiophores and narrower conidia, an apparently new anthracnose on cotton is described under the provisional name *Collectotricum indicum*. The falcate conidia averaged 20μ to 22.5μ by 2.5μ, ranging from 15μ to 25μ by 1.8μ to 4.3μ. The conidiophores were 7.7μ to 13.2μ by 1.6μ to 2.7μ, and the dark brown setae, 76.5μ to 255μ [?] by 3.8μ to 7.6μ.

The disease is reported as having been long prevalent in the Central Provinces, affecting bolls, lint, and seed, and also causing a seedling blight, but in 1931, an unusually wet year, a serious epidemic occurred. The varieties Bani, Roseum, and Buri were resistant, while the Verums were very susceptible. The disease is carried in the seed. Seed treatment with Uspulun and sulfuric acid greatly reduced the incidence of seedling blight due to the disease without serious effect on germination.

New treatments for cucumbers, J. D. WILSON (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 68–75*).—In a 4-yr. trial for the control of cucumber diseases in the field, bordeaux mixture with calcium arsenate and a dust composed of copper sulfate, hydrated lime, and calcium arsenate gave better control of bacterial wilt (*Bacterium tracheiphilum*) but less vine growth and yield than dusts com-

posed of gypsum (calcium sulfate) with calcium arsenate or of hydrated lime with lead arsenate.

In 1933 tests were conducted with 16 dust and spray combinations, and in 1934 with more than 20 combinations. In 1934 the tests included muskmelons. The results are tabulated.

A 300-mesh gypsum was found to flow through a hand-operated dust gun much better than the ordinary product. A 300-mesh limestone, mixed with diatomaceous earth as a fluffer, was not found superior to gypsum or hydrated lime on cucumbers. Calcium arsenate with [wheat] flour (1:5), in the two years tested, adhered well, allowed good vine growth and yield, and controlled bacterial wilt well. Flour proved better than clay or talc as diluent and sticker.

Cucumber plants treated with several recently introduced, comparatively insoluble copper compounds, applied either as dusts or sprays, grew more vigorously and yielded better than those receiving bordeaux mixture. Dust applications gave slightly better results than sprays. When mixed with a good sticker and arsenical, they have been found to give good control of bacterial wilt, but their ability to check leaf spot and other diseases remains to be determined. Hydrated lime with these compounds did not prove beneficial to growth.

Dutox reduced growth and yield, while calcium arsenate or Manganar caused no visible injury to vines.

The best possibilities for both cucumbers and muskmelons so far appear to the author to lie in a 1–5–1 mixture of one of the "insoluble" copper compounds, a good diluent and sticker, and an arsenate.

Potato spraying: The value of late applications and magnesium-bordeaux, R. BONDE (*Amer. Potato Jour., 11 (1934), No. 6, pp. 152–156; abs. in Maine Sta. Bul. 377 (1934), p. 420*).—"In some years in Maine, injury by late blight of potatoes is severe in spite of efforts by growers to prevent it. Surveys and experiments showed that late-blight control was improved and yield increased by the later spray applications of the season. In some depleted soils the use of a magnesium lime in place of a calcium lime in bordeaux spray enabled the plants to recover from magnesium-deficency sickness and to yield considerably more."

Rice diseases, E. C. TULLIS (*Louisiana Sta., Rice Sta. Bien. Rpt. 1933–34, pp. 19, 20*).—The results are briefly summarized of studies conducted during 1933 and 1934 on the following: The development of the perfect stage (*Ophiobolus miyabeanus*) of the *Helminthosporium* leaf spot of rice, varietal differences in resistance to the foregoing, the perfect stage of stem rot of rice (*Leptosphaeria salvinii*), the effects of Ceresan and formaldehyde dust seed treatments on rice, and the association of fungi with stigmonose of rice kernels.

Diseases of sugar-beet, H. H. STIRRUP ([*Gt. Brit.*] *Min. Agr. and Fisheries Bul. 93 (1935), pp. 28–58, pls. 8*).—This discussion is based largely on a survey made in 1934 of the chief European sugar beet areas, and notes the nature, distribution, severity, and usual methods of control of the following diseases: Blackleg (*Phoma betae*, often associated with *Pythium debaryanum*, and *Aphanomyces laevis*), strangle disease or girdling (attributed to various causes in different places), heart rot and dry rot (due chiefly to boron deficiency), mosaics, virus yellows, and crinkle (all due to viruses), nonvirus types of yellows (due to *Pythium*, to manganese deficiency, to *Fusarium* or *Verticillium*, or to physiological disorders), downy mildew (*Peronospora schachtii*), powdery mildew (*Microsphaera betae*), leaf spots (*Cercospora beticola*, *Ramularia beticola*, and *Phoma betae*), rust (*Uromyces betae*), violet root rot (*Helicobasidium purpureum*=*Rhizoctonia violacea*), scab (*Actinomyces scabies* and *A.*

tumuli), crown gall (*Bacterium tumefaciens*), root tumor (*Urophlyctis leproides*), and the disease due to *Typhula betae*.

Nomenclature of the tobacco downy mildew fungus, E. E. CLAYTON and J. A. STEVENSON (*Phytopathology, 25 (1935), No. 5, pp. 516–521, figs. 3*).—The organism causing the downy mildew or blue mold of tobacco has been in the past referred to *Peronospora hyoscyami* de B., but this was in error since it does not infect *Hyoscyamus niger*. A comparative study made with American downy mildew material and the original collections of *P. nicotianae* Speg. from Argentina indicates that this latter name cannot be applied to the American species. The oospores of *P. nicotianae* run uniformly much larger (62μ to 78μ in contrast to 32μ to 40μ), they are golden brown rather than dark brown, and they have a distinct wall pattern lacking in the American species. Conidia of *P. nicotianae* were reported by Spegazzini to germinate with the production of zoospores in contrast to the production of germ tubes by conidia of the American species. On the other hand *P. tabacina* Adam described from Australia fits the American species in all essential particulars, and the use of this name is recommended.—(*Courtesy Biol. Abs.*)

Virous diseases of greenhouse-grown tomatoes, L. K. JONES and G. BURNETT (*Washington Sta. Bul. 308 (1935), pp. 36, figs. 8*).—After listing 13 virus diseases of tobacco transferable to tomato and of possible importance to the greenhouse-grown crop, brief discussions are given of the known facts about 11 other recognized tomato viruses: Big bud, bunchy top, curly top, delphinium virus disease, fernleaf, spot necrosis, spotted wilt, stripe, vein-banding virus disease, witches'-broom, and yellow (aucuba) mosaic.

The authors then summarize the results of their own studies conducted from 1928 to 1934 on the three viruses most commonly met with in tomato production under glass in the State of Washington, viz, tomato mosaic (=tobacco mosaic No. 1), mottle mosaic (=latent virus of potato), and streak disease (produced by a combination of the other two). Recommended control practices and precautions are also discussed.

Tests of more than 7,000 seeds from plants carrying these diseases disclosed no instance of seed transmission of either virus. All three diseases were very readily transmitted by contact of injured diseased plants with healthy ones. Workmen were found able to introduce the mosaic virus by the use of tobacco. The mottle virus was found to become introduced by volunteer potatoes in the soil or by workmen handling potatoes prior to working with tomato plants. Aphids were found able to transmit the mosaic but not the mottle virus. Spread of these diseases took place in the greenhouse through ordinary training and pruning operations, but was found to be greatly reduced where workmen washed their hands frequently with soap and water while working with the plants. Twelve known hosts of the mottle or latent virus are listed and 63 of the mosaic virus under consideration.

It was found that tobacco mosaic remained active in mosaic- or streak-infected tomato tissue in the soil for 9 weeks. Less than 1 percent of healthy tomato plants placed in soil in which portions of streak or mosaic plant tissue had been stored for 61 days contracted the mosaic disease. The mottle virus as a component of the streak disease was inactivated in infected plant tissue stored in the soil for from 3 to 4 weeks.

In tests the mottle, mosaic, and streak diseases reduced the yields of fruit 1.8, 15, and 44.4 percent, respectively, but observations indicated that with early introduction into a greenhouse planting the streak combination may cause even greater losses. Semiannual rotation of beds with another crop was found

sufficient to eliminate practically all danger of virus development from contact of newly set plants with the remains of a previous diseased crop in the soil.

Some physiological disorders of fruit trees, T. Wallace (*Ann. Appl. Biol., 21 (1934), No. 2, pp. 322–333*).—This paper summarizes the more important investigations relating to physiological disorders of fruit trees and the main conclusions which have been reached. The disorders are discussed under the following headings: Disorders due to deficiencies of essential elements—N, K, P, Ca, Mg, S, Fe, Mn, B, Cu, and Zn; disorders due to toxic effects of salts and of excess Cl, Mn, and B; disorders associated with unfavorable meteorological factors and deficiency or excess of soil moisture—cork, drought spot, water core, and bitter pit of apple and pear fruits, flavescence, rougeau, and sécheresse of vines, and little leaf of *Citrus* in Palestine; and miscellaneous disorders—mottle leaf of *Citrus* and decline disease of the date palm.

A bibliography of 80 papers is appended.—(*Courtesy Biol. Abs.*)

Defoliation from the use of calcium cyanamid, H. A. Cardinell and G. F. Gray (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 101–106, figs. 3*).—It is reported that following the use of calcium cyanamide in the spring of 1934 by many Michigan fruit growers the resulting growth was for the most part quite comparable to that resulting from the use of ammonium sulfate or other forms of nitrogen, but in some orchards more or less serious defoliation of cherry, apple, peach, and currant occurred. In some cases the first yellow leaves appeared on cherry trees about 2 weeks after petal fall and shedding continued until late August, the more severe defoliation being on the lighter, dryer soils deficient in organic matter. Trees located in low, moist spots in severely defoliated blocks showed little or no leaf injury.

Investigations revealed that the injury was due to the use of the calcium cyanamide. One outstanding characteristic of the primary stage of injury was the brown or dead tips on the older leaves. With more severe leaf injury, the dead or brown area, ⅛ to ¼ in. wide, extended marginally downward toward the base ½ to ⅝ of the way in sour cherries and usually all the way in sweet cherries. Soon afterward the leaves began to turn yellow and drop. As the season advanced, an increasing number of trees showed signs of defoliation and the defoliation increased in severity.

Until further study can be made, growers are advised to apply cyanamide, especially on lighter soils, only in the fall or very early spring.

Rate of increase in area of apple-spur leaves, R. C. Baines and H. M. Benedict (*Phytopathology, 25 (1935), No. 3, pp. 373–375, figs. 2*).—A graph is presented showing an increase in the area of apple-spur leaves for a 15-day period (April 25 to May 10, 1934) at the Indiana Experiment Station, which amounted on the average at the end of the period to nine times the original area at the beginning of the period. Photographs of representative spurs and leaves at the beginning, middle, and end of the period are given. This rapid increase in foliar area results in difficulty in maintaining protection by sprays early in the season.

Functional diseases of the apple in storage, H. H. Plagge, T. J. Maney, and B. S. Pickett (*Iowa Sta. Bul. 329 (1935), pp. 35–79, figs. 28*).—On the basis of their long continued studies (E. S. R., 51, p. 451), the authors describe, illustrate, and clearly point out for the benefit of growers, dealers, and others the differences between various nonparasitic disorders of apples met with in storage. Brief accounts are given of conditions influencing the diseases, and methods of control are outlined. Apple scald, Jonathan spot, mealy break-down, soggy break-down (embracing soft scald), brown heart, internal brown-

ing, water core, bitter pit, freezing injury, and cork and drought spot are included. *Penicillium* soft rot is also described.

Suggestions for handling and storing apples and discussions of picking maturity, storage temperature, storage humidity, and duration of storage are given. The differences of various apple varieties in their behavior relative to these disorders and to storage conditions are brought out.

For cold storage about 36° F., with 90 percent relative humidity, proved optimum in 10-yr. tests, particularly where oiled paper was used to control scald. At the temperature mentioned less soggy break-down occurred than at 30° and 32°.

The role of zinc sulfate in peach sprays, K. J. Kadow and H. W. Anderson (*Illinois Sta. Bul. 414 (1935), pp. 205–255, figs. 9*).—Zince sulfate with lime was first announced by Roberts and Pierce in 1929 (E. S. R., 67, p. 700) as a promising spray for the control of the peach bacterial spot caused by *Bacterium* (*Phytomonas*) *pruni*. In the same year the station began a series of tests with this material on peaches (E. S. R., 67, p. 275), continuing through 1934, the results and conclusions of which are here presented.

Zinc sulfate was found to be a very weak fungicide and far less effective than sulfur against peach scab or brown rot. Laboratory tests indicated that the zinc sulfate-lime spray was no more effective for brown rot control than a lead arsenate-lime spray. The field and laboratory data presented indicate, in general, that no matter how applied zinc sulfate is of no practical value if used solely as a bactericide for the control of the bacterial spot of peach.

Analyses indicated that zinc is always present in the ash of normal peach tissue. When applied in a nutrient solution to peach seedlings growing in purified quartz sand, zinc sulfate (3 p. p. m.) increased the growth measurably, but in Carrington silt loam soil it had practically no effect. It is held probable that its addition to soil deficient in soluble zinc would result in stimulation of growth, as reported by other workers. Zinc sulfate in the nutrient solution, or applied as a spray, had no effect on foliage color as measured by intensity of the pigment. A marked color decrease was noted, however, in trees sprayed with lead arsenate-lime. Zinc sulfate added to a lead arsenate-lime mixture did not increase chlorophyll formation above the normal, but it did counteract the tendency of the lead arsenate to decrease the green color.

Applied as a spray ingredient, zinc sulfate not only did not cause any noticeable injury, though reducing leaf area slightly, but, when applied with lead arsenate-lime, it practically eliminated the injury commonly resulting from the use of lead arsenate-lime alone and due to the formation of water-soluble arsenic. Lime alone added to lead arsenate sprays failed to prevent arsenical injury because of rapid carbonation. It was found that the conversion of lime from the hydrate to the carbonate may be completed in periods varying from a few hours to a week or 10 days after application, depending upon temperature and humidity, and that thereafter, in the presence of lead arsenate, it greatly increases the water-soluble arsenic. This is said to explain the frequent occurrence of severe lead arsenate spray injury to the peach under Illinois growing conditions. The ability of zinc sulfate to eliminate arsenical spray injury is held to lie in its power to prevent the rapid carbonation of lime and, probably, to precipitate an insoluble zinc arsenate whenever arsenic acid is formed.

The formula, based upon 8 yr. of experimentation, recommended for Illinois peach spraying, is given as 6 lb. of zinc sulfate, 6 lb. of hydrated lime, and 3 lb. of acid lead arsenate to 100 gal. of water.

The olive knot disease: Its inception, development, and control, E. E. WILSON (*Hilgardia* [*California Sta.*], *9* (*1935*), *No. 4*, *pp. 233–264*, *figs. 10*).—The California history of this disease due to *Bacterium savastanoi*, together with the chief known facts about it, are reviewed, and the results are given of recent studies on the olive knot and its control. The Mission olive, usually the least susceptible variety, developed the disease severely in many cases following the freeze of December 1932, and the trouble is said to have changed from one of little importance to one of great destructiveness within recent years.

Starting as scattered infections in a few trees, the disease was found to spread gradually to adjacent trees. Other host plants are not considered important sources of infection for the olive orchard. It was found that the bacteria may survive in dried exudate for several days, indicating that long-distance spread may take place through nursery-stock shipment and through the movement of pruners from orchard to orchard. No evidence was found that insects commonly transmit the disease.

Confirming earlier work, experiments showed that when the knots are wetted the bacteria may be visibly exuded to the surface within a few minutes, and that they may be spread downward by rains, causing infections on healthy limbs below. In a number of orchards spread was apparently more rapid in a northerly direction, probably due to the direction of the prevailing winds during the rains responsible for the dissemination of the disease. A detailed field study showed that, although the disease may be initiated during almost any rainy period, most infection occurred during the longer rains of midwinter.

It was found that wounds of some sort are apparently necessary for infection. Freezing injuries, pruning wounds, bark cracks produced by the emergence of suckers, and scars produced by the dropping of blossoms, racemes, or leaves were common avenues of entry. Drought and the disease itself, by increasing defoliation, were found to cause increased leaf-scar infection. Leaf scars formed during the spring were not infectible the following autumn. Apparently, therefore, such leaf scars as are attacked by the bacteria during winter must be formed either during the winter, when continued leaf fall would provide fresh, infectible tissue, or at an earlier period when cork formation is slow.

Under field conditions, external symptoms in the form of knots did not develop during the winter. Even when infections occurred in December, the knots did not appear until temperatures were favorable for growth of the host in the spring.

In the studies on control the following spray materials were tested: Home-made bordeaux mixture, commercial bordeaux plus a spray oil, zinc sulfate plus lime, lime-sulfur, sodium fluosilicate, copper ammonium silicate, copper resinate in an emulsifiable pine oil, and a so-called "basic copper sulfate." Home-made bordeaux mixture, in strengths of 4–4–50, 6–6–50, and 8–4–50, prevented infection to a considerable degree. All of the other materials, with the exception of sodium fluosilicate, reduced infection somewhat, but not as much as bordeaux.

Preliminary tests indicated that under California conditions the first application should be made in the fall before rain starts and spraying repeated during winter and spring, further studies being needed to determine the optimum number. Occasional moderate leaf drop following bordeaux spray did not cause damage enough to warrant objections to this mode of control.

Physiological gradients in citrus fruits, A. R. C. Haas and L. J. Klotz (*Hilgardia* [*California Sta.*], *9* (*1935*), *No. 3*, *pp. 179–217*, *figs. 4*).—Since lesions caused in citrus fruits by certain fungi, injuries due to fumigation and oil spray, and physiological break-downs, such as granulation and storage spots, are more commonly found on and in the calyx end of the fruit than elsewhere, while certain other fungus spots and endoxerosis occur more commonly in the stylar end, one of the principal objects of this investigation was to find whether there are, in the fruits, differences in the physical or chemical composition of susceptible and resistant parts which might serve as a basis for explaining the characteristic localization of the lesions. The analyses, detailed results of which are given, showed the existence of certain relatively large differences.

The stylar (apical) portions of the fruit were found to exceed the calyx (basal) portions in respect to the following: The specific gravity, carotenoid content, total N, percentage of dry matter, total sugars, osmotic pressure, and phosphate in the pulp juice of mature citrus fruit in general; osmotic pressure, oil content and starch color reaction in the peel, and percentages of Na, K, and P in the dry matter of the peel; and percentage of K and P in the gland-bearing portion of the peel of mature Valencia oranges.

The calyx portions were found to exceed the stylar portions in respect to the following: Iodine-fixing power, total ash, and percentage of Ca and K in the pulp juice of mature oranges; percentages of ash, Ca, Mg, and Fe in the dry matter of orange peel; total sugar in the peel of lemon, grapefruit, and orange; osmotic pressure of the juice of lemon peel (silver stage); permeability of grapefruit and orange surface tissues; increase of permeability of orange due to HCN treatment; and water loss through the peel of lemons and oranges.

No difference between the apical and basal ends of the fruit was noted in respect to amino N content of the pulp juice of orange. In mature Valencia oranges a positive relation was found between P and N, on the one hand, and sugar, but none between K and sugar. Valencia oranges from trees grown in sand cultures deficient in K showed break-down of the peel.

The effect of leaves on the loss of water from fruits was considerably greater with immature than with mature fruits. The effect of increasing maturity of the fruit in resisting water loss was due to the increase in osmotic pressure. The possible roles of osmotic pressure in certain physiological diseases of citrus fruit are described.

Comparative histology of healthy and psorosis-affected tissues of Citrus sinensis, I. E. Webber and H. S. Fawcett (*Hilgardia* [*California Sta.*], *9* (*1935*), *No. 2*, *pp. 71–109*, *pls. 7*).—Detailed comparison was made between the microscopic structure, appearance, and staining reaction of the tissues of bark, wood, and leaves from healthy Valencia and Washington Navel orange trees and those of corresponding tissues from trees affected by psorosis (scaly bark) taken from different localities and at different times in the year.

The study showed that abnormal browning of the contents of parenchyma cells, abnormal periderm production, and sometimes gum production were characteristic of the disease. Normal periderm formation in healthy stems and abnormal periderm formation in stems and leaves affected by psorosis occurred immediately beneath cells with contents that had turned brown. In fact, abnormal browning of primary cortical parenchyma cells was found to be the first visible symptom of psorosis in the bark of trunks, and a similar browning of epidermal and mesophyll cells was the first sign of psorosis in mature leaves. In the stem this was followed by the development of a

phellogen (cork cambium) layer immediately under the darkened cells. On the outside this phellogen produced phellem (cork) similar to healthy phellem, and on the inside it produced phelloderm much more abundantly than in healthy stems, resulting in the formation of small, macroscopically visible eruptions on the bark surface. It was found that as the disease progresses groups of parenchyma cells nearer the center of the stem become darkened, and new phellogen is formed beneath them. In time the tissues external to the abnormal phellem are sloughed off in scales.

In psorosis-affected, mature leaves, round to irregular, discolored, and corky areas, often in the form of complete or partial rings about 2 to 7 mm in diameter, were present in variable numbers. Sections showed that the cork was produced by a phellogen formed beneath epidermal or mesophyll cells with darkened contents.

The apparent absence of a microscopic causal organism, together with the mosaiclike effect seen in young leaves and the browning of cells attended by hyperplasia in adjacent tissue, indicates that the disease may be caused by a virus, as suggested by Fawcett (E. S. R., 71, p. 803), who found the disease transmissible by budding and rooted cuttings.

The effects of zinc and iron salts on the cell structure of mottled orange leaves, H. S. Reed and J. Dufrénoy (*Hilgardia* [*California Sta.*], *9* (*1935*), *No. 2, pp. 111–141, pls. 2, figs. 11*).—This contribution describes the cytologic characteristics of leaves from orange trees affected by "mottle-leaf", a functional disorder related primarily to soil conditions, and compares them with the changes toward normality brought about by applications of zinc sulfate to the foliage or to the soil and of C. P. iron sulfate spray.

Evidence is presented that mottle-leaf of citrus is characterized by a shift in the oxidation-reduction equilibrium of the leaf cells. Chemical analyses showed that nitrites exist in the expressed sap of mottled leaves but not in that of green leaves. Indications of a reducing action in the palisade cells of mottled leaves were also shown by their power to reduce methylene blue and nile blue A.

Profound changes in the cytological conditions were found associated with the recovery of mottled trees after the application of zinc. For example, in the green leaves of new shoots whose growth had been promoted by zinc, neither calcium deficiency nor phloem necrosis was evident, while chloroplastids developed to fair size and formed starch. The beneficial effects were especially striking when old and depauperate leaves were sprayed with zinc sulfate. Although their histological organization was not changed, there was marked cytological restoration.

The beneficial effects of iron salts on hypoplastic cells of mottled leaves were negligible. Cytological investigations showed that iron can be detected even in the degenerated plastids of hypoplastic cells.

The distribution of iron and zinc in the plant tissues was determined by a combination of microincineration and microanalysis. It was found that the ashes preserve the histological and cytological features of the tissues sufficiently to afford definite information concerning the distribution of these elements in leaves and buds. The use of potassium mercuric thiocyanate upon the dilute sulfuric acid extract of ashed leaves, to which a drop of 0.1 percent $CuSO_4$ solution had been added, gave violet crystals, indicating the presence of zinc and confirming the results obtained by the use of sodium nitroprusside on microincinerated tissue sections.

It was demonstrated that zinc accumulates in buds which are to produce green tissues and in the palisade cells of green leaves, an indication that it is

intimately concerned with the oxidation-reduction potential of the cell. It is pointed out that the effects of zinc suggest that some reaction has been initiated by which the proteins and carbohydrates of the cells have been utilized to supply energy to the cells, and that there is evidence that this is a process of oxidation in which the sulfhydryl compounds play a controlling role.

Copper content of citrus leaves and fruit in relation to exanthema and fumigation injury, A. R. C. HAAS and H. J. QUAYLE (*Hilgardia [California Sta.], 9 (1935), No. 3, pp. 143–177, figs. 9*).—To throw light on the relation of Cu in citrus tissues to cyanide injury and of Cu deficiency in citrus tissues to exanthema, methods of other workers were combined, and accurate determinations were made of the amounts of Cu in a wide range of samples of citrus leaves and fruits taken from various localities. The analytical procedure is described in detail. Samples having a dry weight of from 75 to 100 g were used. Fe and P were also determined. The results of the analyses indicate that the amount of Cu required for healthy growth varies with the soil and climate. The authors advise against adding amounts of copper sulfate above 5 lb. per tree-square, however, as likely to cause injury on many soils.

Leaves of exanthema-affected citrus trees showed a reduced Cu content over those from healthy trees, confirming the results of Oserkowsky and Thomas with pears (E. S. R., 70, p. 336). From limited analyses the same appeared to be true for the fruit. That control of exanthema could be obtained readily in the field with relatively small amounts of Cu was evident.

On account of the variation shown in the Cu content of leaves and fruit from different localities and even from different groves in a locality, it appeared that analyses for Cu content would give little indication as to whether trees might be suffering from Cu deficiency or from Cu in excess of that safe under HCN fumigation.

In sand cultures in large tanks, typical symptoms of exanthema were produced on citrus trees after 6 or 7 yr. where a nutrient solution lacking Cu had been employed, but these symptoms were gradually and almost completely overcome by adding 0.05 p. p. m. of $CuSO_4$ to the culture solution.

In preliminary studies on the relation of Cu to HCN fumigation injury, citrus trees that had year after year shown fumigation damage in comparison with trees in other groves were found to contain increased amounts of Cu. It is suggested that when Cu is used to correct exanthema, fumigation should not be practiced before sufficient time has elapsed for growth and reproduction, soil precipitation, and leaching to reduce the absorbed Cu down to a concentration such that HCN will not bring about injury.

Growth and composition of Deglet Noor dates in relation to water injury, A. R. C. HAAS and D. E. BLISS (*Hilgardia [California Sta.], 9 (1935), No. 6, pp. 295–344, figs. 20*).—One of the chief factors unfavorably affecting the quality of Deglet Noor dates in California is that known as "water injury", which consists of two types—checking, which predisposes the fruit to blacknose, and tearing, which exposes the pulp to micro-organisms that bring about fermentation and decay. To gain light on this problem, studies were made on the fruits at various stages of development. Growth was measured quantitatively as to length, diameter, fresh weight, dry weight, and ash content. The inorganic constituents and the sugars were also determined, and the location of the meristematic tissue in the fruit was worked out. Studies were also conducted in the field and in the laboratory to determine the factors influencing the development and control of checking and tearing, involving the measurement of water loss from fruit transpiration, the effect of time and type of bagging, and the results of aeration.

The average length and fresh weight per fruit in 1932 reached a maximum on August 12 and fell gradually thereafter as the fruit matured, while dry weight and ash content showed a gradual but uninterrupted rise throughout the season. The percentage of water in the fresh pulp increased from May 21 until July 1, after which it decreased until maturity. July 1 was coincident with the greatest growth rate. The region of most rapid growth in the fruit was that enclosed by the calyx. The average amount of K per fruit (without seed) proved to be 2 or more times that of total N and over 10 times that of P. The percentages of K, Na, Ca, Mg, and Mn in the ash remained relatively uniform throughout the season. In most samples the average amount of Ca exceeded that of Mg. The amounts of inorganic constituents increased at a more or less constant rate throughout the season; on the other hand, the curve for fresh weight of an average fruit reached a maximum on August 12 and decreased thereafter. Higher percentages of reducing sugars were found more consistently in the tip than in the stem halves of fruit analyzed at different stages of development. Much more K was found in the seed than Ca, Mg, Na, or Mn, and a larger amount of Mg than Ca was present.

Checks on the fruit skin when examined microscopically consisted of epidermal ruptures involving only the cuticle and outer wall at first. The cells bordering the larger checks died, making the checks more visible, but no callus tissue was found.

Fruit bunches were bagged on July 22, August 12, and September 1, 1932. The smallest percentages of checked fruits were found in bunches not bagged, the highest in those bagged on the earliest date. Blacknose developed in the absence of rain in severely checked fruits and mostly in bunches bagged prior to August 12. In laboratory studies the tendency of fruits to check when immersed 2 days in water increased from 15 percent on July 22 to a maximum of 97 percent on August 12, and then dropped to 8 percent on September 1. Most checking occurred between July 22 and August 12. The evidence indicates that factors which favor checking during this period are the approach to maximum fruit length, diameter, and fresh weight; the relatively complete cessation by May 25 of growth in the epidermis of the tip end, which is, therefore, unable to accommodate sudden increases in volume from rapid intake of water; rapid increase in the average amount of total sugars, paralleled by similar changes in osmotic pressure sufficient to cause mild rupturing; and the higher transpiration rate at that time which makes possible greater condensation of moisture within the bunch than later, when the content of sugar is very high and that of water low.

Factors which tended to reduce checking following this period were principally a decrease in the average length, diameter, and fresh weight per fruit, accompanied by a progressive shrinkage of the pulp and a lessening of epidermal tension beginning at the tip end and proceeding toward the base as the season advanced. A condition in the fruit evidently resulted whereby sudden increases in volume at the tip were accommodated by the epidermis, and no checking resulted. During the late stages, when the osmotic pressures were enormous, the fruits were not ordinarily affected with checking as a result of water injury but showed violent ruptures (tears) in the unripe, turgid, basal portion where the epidermis was unable to accommodate further increase in volume.

Bagging with paper reduced the amount of tearing following rain and most of all when the skirts were raised to allow more aeration. Burlap bagging, however, gave a rather high percentage of damaged fruits in the bunch tested. Fruits collected September 15, 1933, showed more water loss in the laboratory from the stem than from the tip half and about 12 times

as much at 122° F. as at 70°. The aeration of fruit bunches by means of the separation of strands reduced the percentage of checked fruits, whereas early seasonal bagging without aeration greatly increased it. These results indicate that such water injury, and hence blacknose, may be subject to control.

[**The results of bulb treatments on Easter lily bulbs**], W. B. SHIPPY (*Florists' Rev.*, *75* (*1934*), *No. 1888*, *pp. 13–15*, *figs. 2*).—The results are presented of tests conducted in 1930 and 1931 by the Florida Experiment Station on the use of various materials for dusting, dipping, or soaking the bulbs just prior to planting to arrest decay. Graphs and tabulations of the results are given. Hot-water treatment in 1931 greatly delayed sprouting. Little or no injury resulted in either year from $HgCl_2$ 1:1,000, Semesan 1:400, formaldehyde (40 percent) 1:240, or lime-sulfur 1:40. Some of the other materials tested proved highly injurious.

Air currents as a possible carrier of Ceratostomella ulmi, S. J. SMUCKER (*Phytopathology*, *25* (*1935*), *No. 4*, *pp. 442*, *443*).—Spore-bearing cultures of the Dutch elm disease fungus were fanned 5 min. with a small piece of cardboard at one end of a large closed room where sterile agar plates were left exposed 2 hr. After 3 days *C. ulmi* appeared on a large proportion of the plates. None appeared on control plates previously exposed in the same room.

The Dutch elm disease eradication program in the United States, O. N. LIMING (*Natl. Shade Tree Conf. Proc.*, *10* (*1934*), *pp. 67–72*).—This paper gives the methods employed, the costs, and the results of the work in the New Jersey, New York, and Connecticut areas, up to August 25, 1934.

Notes on the work of the Dutch elm disease laboratory, C. MAY (*Natl. Shade Tree Conf. Proc.*, *10* (*1934*), *pp. 73–75*, *fig. 1*).—The results of laboratory work with 8,763 unhealthy elm specimens sent in to the U. S. Department of Agriculture laboratory at Morristown, N. J., indicated that the active symptoms of *Cephalosporium* dieback appear somewhat later in the season than those of the Dutch elm disease. *Verticillium* wilt proved to be less common in this region than in Ohio.

Advances in our knowledge of the Dutch elm disease, R. K. BEATTIE (*Natl. Shade Tree Conf. Proc.*, *10* (*1934*), *pp. 76–78*).—This is a brief review of the progress made during the previous 12 mo.

A new canker disease of red pine, caused by Tympanis pinastri, J. R. HANSBROUGH (*Science*, *81* (*1935*), *No. 2104*, *p. 408*).—This is a preliminary report on the discovery of an attack by *T. pinastri* on *Pinus resinosa* in southern Connecticut. The appearance of the fungus fructifications is described. The parasitism was confirmed by artificial inoculations. The disease is reported as present apparently only in plantations, where it is more prevalent in pure stands than in mixtures with white pine. Its incidence seems to be definitely correlated with the severe drought of 1930 in southern New England.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The ornithology of the Republic of Panama, L. GRISCOM (*Bul. Mus. Compar. Zool.*, *78* (*1935*), *No. 3*, *pp. 261–382*).—Following an introduction, a history of Panama ornithology (including the principal faunal papers dealing with Panama birds), and a discussion of the general physiography and climate, the life zones of Panama and their bird life are dealt with at some length (pp. 272–289). This is followed by a distributional check list of Panama birds, arranged systematically, in which 1,038 species and subspecies are included.

Artificial incubation and brooding of game birds, E. S. WEISNER (*Michigan Sta. Quart. Bul.*, *17* (*1935*), *No. 3*, *pp. 113–116*).—Observations and data on the

rearing of game birds obtained at the State Game Farm near Mason are reported upon. The results of hatches by breeds showing number of eggs set, number and percentage of infertiles, percentage of healthy chicks and of crippled chicks, and number reared to liberation age, including pheasants, mallard ducks, Hungarian partridges, wood ducks, black ducks, sharp-tailed grouse, and ruffed grouse, are summarized in a table.

The relation of predators to quail increase, V. LEHMANN (*Internatl. Assoc. Game, Fish, and Conserv. Commrs. Conv., Montreal, Proc., 28 (1934), pp. 36-38*).—The author reports upon predator depredations, based upon findings in 100 "dummy" quail nests containing actual quail eggs that were set up in June 1924 in four different localities in San Jacinto and Liberty Counties in eastern Texas, where quail and predators were present in goodly numbers. All but 8 of the 100 nests were destroyed by some 14 predatory animals, led by the hog, 19; armadillo, 18; fox, 13; skunk, 13; crow, 7; opossum, 7; snake, 7; and rat, 5.

Established in the lower Rio Grande Valley by 1880, the 9-banded armadillo has rapidly spread over the greater part of Texas and into parts of Oklahoma and Louisiana.

The intermediate hosts of Fasciola hepatica and Fascioloides magna in the United States, W. H. KRULL (*North Amer. Vet., 15 (1934), No. 12, pp. 13-16, fig. 1*).—The snails which have been incriminated as intermediate hosts of the liver fluke *F. hepatica* in the United States are *Galba bulimoides*, *G. bulimoides techella*, *G. cubensis*, *G. ferruginea*, *Fossaria modicella*, *Pseudosuccinea columella*, and *Lymnaea traskii*. Those incriminated as hosts of *F. magna* are *G. bulimoides techella*, *F. modicella*, *F. modicella rustica*, and *P. columella*. The distribution by States is shown. *L. traskii* has been determined experimentally to be a new intermediate host of the liver fluke, evidence being presented to show that it becomes infected only while very young.

Experimental studies of transpiration and heat economy in insects, I-XII [trans. title], K. KOIDSUMI (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 12 (1934), No. 1, pp. 179, figs. 47; 12 (1935), No. 3, pp. 281-380, figs. 11*).—This consists of a series of 12 contributions each of which is accompanied by a list of references to the literature.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1934, E-320, pp. 3; E-321, pp. 2; E-322, pp. 6; E-323, pp. 4; E-324, pp. 3; E-325, pp. 12, pls. 2; E-326, pp. 4; E-327, pp. 5; E-328, pp. 2; E-329, pp. 2; E-330, p. 1; 1935, E-331, pp. 2; E-332, pp. 2, pls. 2; E-333, pp. 2; E-334, pp. 4, pls. 2; E-335, pp. 6, pl. 1; E-336, pp. 2; E-337, pp. 8; E-338, pp. 2; E-339, pp. 5; E-340, pp. 7; E- 341, pp. 2; E-342, pp. 2; E-343, pp. 13; E-345, pp. 4, pl. 1; E-346, pp. 2; E-347, pp. 6; E-348, pp. 6; E-349, pp. 3; E-350, pp. 4*).—Practical summaries of information are given in these mimeographed contributions, namely: Control of Wireworms on Irrigated Lands in the Pacific Northwest, by M. C. Lane; Black Flies or Buffalo Gnats, by F. C. Bishopp; A Survey of the Use of Sterile Maggots in the Treatment of Suppurative Infections in the United States and Canada, by W. Robinson; Screw-Worm Control in the Southeastern States, by F. C. Bishopp; The Turnip Aphid, by N. Allen; The Fumigation of Tobacco Warehouses, by W. D. Reed, E. M. Livingstone, and A. W. Morrill, Jr.; The Control of Ants Found on Fruit and Shade Trees, Ornamental Shrubs, and Lawns, by B. A. Porter, W. Middleton, and W. H. Larrimer; Specifications for Remedying Termite Damage to Various Types of Buildings, by T. E. Snyder; Paradichlorobenzene-Crude Cottonseed Oil Emulsion for the Control of the Peach Borer, by O. I. Snapp; Bedbug Control; House Spiders; Crickets in the Home; An Improved Sulphur Burner for Mush-

room-House Fumigation, by A. C. Davis and H. D. Young; The Destruction of Wasps and Yellow Jackets or Hornets; Outbreak of Black Grain-Stem Sawfly [*Trachelus tabidus* (Fab.)] in 1934 [in Ohio, Pennsylvania, and Virginia] and Comparison of Its Status with That of the European Wheat Sawfly [*Cephus pygmaeus* L.], by C. C. Hill; The Eye Gnat [*Hippelates* spp.] in the Coachella Valley, California, by R. W. Burgess; The Cabbage Maggot, by D. J. Caffrey; Fall Chinch Bug Survey Trials in Standing Corn, by C. M. Packard and C. Benton; Provisions for Building Codes for Insuring Protection from Termites and Decay, by T. E. Snyder; Suggestions for the Control of the Pea Weevil in Oregon, by A. O. Larson and F. G. Hinman; The Prevention of Infestations of Insects and Other Pests in Commercial Mushroom Houses, by A. C. Davis; Insect Control on Sun Sumatra Tobacco, by F. S. Chamberlin; Screw Worm Control; Recommendations for the Control of Insects Attacking Certain Vegetables, Small Fruits, and Tobacco, and the Elimination of Harmful Insecticidal Residues from the Market Product, by W. H. White; The Black Widow Spider [*Latrodectus mactans* Fab.]; The Raspberry Fruitworm, by D. J. Caffrey; Insect Pest Control for the Amateur Mushroom Grower, by A. C. Davis; Sulphur as an Economical Control for the Cotton Flea Hopper, by K. P. Ewing and R. L. McGarr, in cooperation with the Texas Experiment Station; The Mexican Bean Beetle and Its Control in the East, by N. F. Howard, L. W. Brannon, and H. C. Mason; and The Mexican Mealybug [*Phenacoccus gossypii* Towns. and Ckll.] on Greenhouse Chrysanthemums, by H. H. Richardson.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 552, 646–650, 656, fig. 1*).—The notes here contributed (E. S. R., 73, p. 339) are as follows: New Host [*Phenacoccus gossypii* Towns. & Ckll.] Records for Two Mealybug Parasites [*Acerophagus pallidus* Timb. and *Pseudaphycus angelicus* How.], by S. E. Flanders (p. 552), contributed from the California Citrus Experiment Station; The Olive Scale *Parlatoria oleae* Colv., by F. H. Wymore (p. 552); Estimating the Dosage-Mortality Curve, by C. I. Bliss (pp. 646, 647); A Technique for Rearing the Corn Earworm (*Heliothis obsoleta* Fab.), by L. O. Ellisor (pp. 647, 648); The Incidence of Screw Worms [*Cochliomyia americana* C. & P. and the Screwworm] in Southern Texas and Louisiana in 1934, by E. W. Laake (pp. 648, 649); A Dewberry Fruit Worm [Possibly the Strawberry Leaf Roller], by G. F. Knowlton (p. 649), contributed from the Utah Experiment Station; *Petrobia tritici* (Ewing) on Onions and Its Control, by S. E. Jones and W. H. Mecom (p. 650), contributed from the Texas Experiment Station; and the Horizontal Movement of Larvae of the Japanese Beetle in Field Plots, by I. M. Hawley (p. 656).

[Work in economic zoology and entomology at the Arizona Station] (*Arizona Sta. Rpt. 1934, pp. 50–52, 84, fig. 1*).—The work of the year briefly referred to (E. S. R., 70, p. 801) includes a study of the life history and ecology of the wood rat (*Neotoma* sp.), which harbors assassin bugs (*Triatoma* sp.); studies of the Coccidae of the State; the biology of range grasshoppers; and psyllid yellows of potatoes.

[Work in economic entomology at the Maine Station] (*Maine Sta. Bul. 377 (1934), pp. 351–356, 375–381, 401–405, figs. 4*).—The work of the year referred to (E. S. R., 71, p. 505) includes that with aphids in relation to the transmission of virus diseases of potatoes and control of flea beetles on potatoes, both by G. W. Simpson; wireworm injury to potatoes, by J. H. Hawkins; apple fruit fly or railroad worm, with control studies by F. H. Lathrop and with life history studies and data on emergence of adult flies by C. O. Dirks; electric light traps for combating apple insects, by Lathrop and Dirks; aphid investigation with special reference to the range of food plants, by E. M. Patch; and wireworms in Maine soils, by Hawkins.

[Economic insects and rabbits and their control by the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 20, 21, 29, 30, 42*).—Data are reported for the biennial period ended June 30, 1934, on the analysis of spray residues; control of household insects with propylene dichloride; infestation of nursery plantings by the strawberry root weevil and its control; the control of the oriental fruit moth, blemishes in wormy fruit due to the codling moth, and fruit tree pests; and a repellent for rabbits.

[Work in economic entomology at the Michigan Station], R. HUTSON (*Michigan Sta. Rpt. 1934, pp. 210–222, figs. 5*).—The progress of work with station projects (E. S. R., 71, p. 217) is briefly referred to, including spraying for the control of the second generation of codling moth, control of (1) household insects, (2) insects on ornamental plantings, (3) the cherry maggot, (4) the apple maggot, (5) blemishes in wormy fruit due to the codling moth, and (6) fruit tree pests. Notes on insects, outbreaks of which occurred during the year, follow.

[Control work with economic insects by the New Hampshire Station] (*New Hampshire Sta. Bul. 284 (1935), pp. 16, 17*).—The work of the year briefly referred to (E. S. R., 71, p. 506) includes that with contact insecticides, by W. C. O'Kane, J. G. Conklin, E. C. Glover, and W. A. Westgate; ovicides, by O'Kane; and oil treatment of drops for prevention of apple maggot emergence, by O'Kane and Conklin.

[Work with economic insects and their control in Ohio] (*Ohio Sta. Bul. 548 (1935), pp. 39–45, 100*).—The work of the year referred to (E. S. R., 71, p. 344) includes that with the codling moth (supplementary control by banding, varietal susceptibility, and tests of new spray materials), by C. R. Cutright; two greenhouse mealybugs (the citrus mealybug and *Phenacoccus gossypii* T. & Ckll.) and white grubs (*Phyllophaga* spp.) in lawns and their control, both by C. R. Neiswander; onion thrips, by J. P. Sleesman; the potato leaf hopper, by Sleesman and H. L. Gui; insect survey of State forest plantings, by J. S. Houser and [J. B.] Polivka; the apple flea weevil, by Houser and R. B. Neiswander; the short-winged chinch bug *Blissus hirtus* Mon. in lawns and chemical barriers for the chinch bug, both by Houser and L. L. Huber; the European corn borer and the corn ear worm on sweet corn, both by Huber; the oriental fruit moth, by R. B. Neiswander; cabbage worms (the cabbage looper, imported cabbage worm, and diamondback moth), by Gui and Sleesman; and wireworm studies at the Northeastern Experiment Farm, by Gui and L. A. Malik.

Principal insect pests of economic plants in São Paulo in 1931–33 [trans. title], J. PINTO DA FONSECA (*Arch. Inst. Biol. [São Paulo], 5 (1934), pp. 263–289; Eng. abs., p. 289*).—Notes are presented on the insect enemies of the principal cultivated plants in São Paulo in 1931–33.

[Economic insects and their control in Western Australia] (*West. Aust. Dept. Agr. Ann. Rpt., 1934, pp. 10, 11*).—The occurrence of and work with the more important insect pests of the year are briefly reported.

Prodromus of agricultural entomology of Italian Somaliland, G. PAOLI (*Prodromo di entomologia agraria della Somalia Italiana. Firenze (Florence): Ist. Agr. Colon. Ital., 1934, pp. 427, figs. 198*).—Following a brief account of the climatology of southern Italian Somaliland and its relation to the insect fauna and notes on the agriculture, the more important insects are taken up in systematic order. An 8-page list of references to the literature and an index are included.

The place of origin and introduction of some of the common vegetable pests, H. L. GUI (*Ohio Veg. Growers' Assoc. Proc., 19 (1934), pp. 59–70*).—This

contribution from the Ohio Experiment Station presents some of the facts, theories, and influences which have contributed to the development of present-day insect problems, especially those brought about by introduced pests.

Planting dates as an aid to potato insect control on Long Island, H. C. Huckett (*New York State Sta. Bul. 652 (1935), pp. 27, figs. 3*).—In experiments conducted at the Long Island Vegetable Research Farm at Riverhead, it was found that "earliness in planting was invariably associated with the production of higher and better quality yields, provided the foliage was effectively sprayed throughout June for the control of the Colorado potato beetle. The results were more marked with the Green Mountain variety than with Irish Cobbler. . . .

"The effect of spraying Green Mountain foliage during June and July for such insects as the Colorado potato beetle, flea beetles, aphids, and leaf hoppers resulted invariably in superior foliage during the latter half of July when compared to plants sprayed only during June for the control of the Colorado potato beetle. This superiority during such a period did not invariably result in notable increases in yield, especially in the earlier plantings. With Irish Cobbler, there were invariably little or no differences in the general condition of the foliage during the first half of July as a result of additional spray applications during July.

"An attempt was made to extend artificially the growing period of the plant by 'sprouting', i. e., forcing, the tubers of the first planting to escape fully the hazards of midseason. The results with Green Mountain gave some evidence that this method might prove serviceable.

"It is recommended that more emphasis be placed on earlier planting as a rational means of mitigating the effects of aphid, leaf hopper, and flea beetle injuries at midsummer."

[Rice insect work by the Louisiana Rice Station] (*Louisiana Sta., Rice Sta. Bien. Rpt. 1933–34, pp. 22–34*).—Reporting briefly upon the findings in investigations of field insects injurious to rice, mention is made by W. A. Douglas of rice stalk borers (the sugarcane borer and the rice stalk borer), the sugarcane beetle, and the rice stinkbug *Solubea pugnax*. A progress report follows of insect control in stored rice by C. L. Stracener, which takes up the collection of samples, field infestation, infestation in samples from warehouses, suggestions for control of insects in rough rice, the effect of milling on insect survival in rice, penetration of rough rice by heat and gases, application of powdered derris as a control, and insect-tight bags.

Dewberry fruit worm and strawberry leaf-roller, G. F. Knowlton (*Better Fruit, 29 (1935), No. 11, p. 11*).—A brief practical account contributed from the Utah Experiment Station.

Two pests of the mango tree: (1) The mauve mango borer Philotroctis eutraphera Meyr., (2) the mango twig weevil Cryptorhynchus goniocnemis Marsh [trans. title], C. J. H. Franssen (*Landbouw [Buitenzorg], 10 [1935], No. 8, pp. 281–291, figs. 11; Eng. abs., pp. 290, 291*).—Brief descriptions are given of the different stages, with notes on the life history of these two minor pests of mango in Java.

A new significance concerning insects attacking elm, E. I. McDaniel (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 142–144, figs. 4*).—A brief account is given of the elm bark beetles *Scolytus multistriatus* and *S. scolytus* in their relation to the transmission of Dutch elm disease. Mention is also made of the dark elm bark beetle *Hylurgopinus rufipes*, a native species causing the death of many trees, which has hitherto been considered of minor importance because it confines its attack to weak trees.

Insect parasites and predators of insect pests, C. P. Clausen (*U. S. Dept. Agr. Circ. 346 (1935), pp. 28, figs. 15*).—A general account is given of various groups of insect parasites and predators of insect pests and their role in controlling such pests.

A list of organic sulphur compounds (exclusive of mothproofing materials) used as insecticides, R. C. Roark and R. L. Busbey (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, E-344, pp. 104*).—Three hundred and fifteen compounds, alphabetically arranged under group headings, are listed with notes on their use as insecticides. Twenty-one publications consulted in compiling this list of organic sulfur compounds used as insecticides and the domestic and foreign patents are listed, and assignee and patentee indexes, a formula index, and a subject index included.

The comparative value of bordeaux mixture, sulphur pyrethrum products in controlling the potato leafhopper and red spider on beans, D. M. DeLong (*Ohio Veg. Growers' Assoc. Proc., 19 (1934), pp. 80–91, figs. 9*).—The results of experimental work conducted are presented in nine charts.

The efficiency of bordeaux mixture as a practical control remedy for the potato leaf hopper both on beans and potatoes has been sufficiently demonstrated, and its application is recommended where only leaf hopper and blight are concerned. Where red spider is present or is quite liable to appear and it is considered desirable to use a spray material, flotation sulfur will give better results. "Where dusting is considered more practical or advisable or where it is desired to use the least amount of time and effort in treating the field, fine dusting sulfur mixed with pyrethrum flowers is recommended as the best known substitute for spraying. Combinations of 95–5 or 90–10 fine dusting sulfur-finely ground pyrethrum flowers thoroughly mixed have given excellent results. Dusting sulfur alone has given good control, but better results are obtained with the combinations of sulfur and pyrethrum. The dusts should be thoroughly applied at the rate of 25 to 30 lb. per acre at 7- to 10-day intervals, and as in the case of sprays should be directed to the under sides of the leaves. If a pyrethrum dust of low pyrethrin content is used, the proportions should be increased, using 15 to 25 lb. of pyrethrum in the combination."

Recent developments in the use of arsenical substitutes for vegetable pest control in New York, H. C. Huckett and G. E. R. Hervey (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 602, 603*).—A brief digest contributed from the New York State Experiment Station.

Arsenical substitutes for controlling vegetable insects, J. N. Roney and F. L. Thomas (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 615–617*).—This contribution from the Texas Experiment Station presents tables showing (1) the percentage of corrected control secured with the various dusts following each application and the relation of control to climatic conditions in southeast Texas in 1934, (2) the gain in yields in pounds per acre of the treated as compared with the actual yields of the untreated plats in one tomato and three cabbage experiments, and (3) the percentage of rotenone and pyrethrins in the dusts used and the cost of materials and mixtures.

The imported cabbage worm, the cabbage looper, the diamondback moth, and the corn ear worm were employed in the tests.

Arsenical substitutes for controlling certain vegetable insects, J. N. Roney and F. L. Thomas (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 618–620*).—In this contribution from the Texas Experiment Station the percentage of corrected control of the banded cucumber beetle and the potato leaf hopper secured with the various dusts following each application, and the relation of control to climatic conditions, in 1933 and 1934, are given in a table.

Summary of results obtained with arsenical substitutes for the control of vegetable crop insects at the Virginia Truck Experiment Station, H. G. WALKER and L. D. ANDERSON (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 603–605*).—A brief summary of derris and pyrethrum dust tests for control of vegetable crop insects at the Virginia Truck Experiment Station.

Derris as an arsenical substitute on vegetables, T. J. HEADLEE (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 605–607*).—This contribution from the New Jersey Experiment Stations reports briefly upon the use of derris in several forms against the Mexican bean beetle during the season of 1934, also the use of derris dust on cabbage and cauliflower to control the cabbage looper, the imported cabbage worm, and the caterpillar of the diamondback moth and on tomatoes to control the hornworm.

The materials made up with ground derris dust were much more effective in reducing the feeding injury to foliage by the Mexican bean beetle than the materials composed of impregnated dusts. The derris-sulfur-clay combination seemed to have a much greater residual effect than any of the others. The results obtained from the application of derris dust to cabbage and cauliflower are said to have corroborated the findings in 1933, and showed that "a derris dust containing 0.8 percent rotenone and 2.8 percent total extractives is the most economical and practical form. This dust consists of 16 parts of ground derris (5 percent rotenone and 18 percent total extractives), 25 parts of sulfur, and the balance clay or talc. Fifteen to 18 lb. per acre were required without hoods, and from 8 to 10 lb. were necessary when applied with hoods." Enough experience and study has been given to the control of the tomato hornworm to demonstrate that derris dust has a definite place in the tomato production program against this pest.

During the past several years derris dusts have been studied on many other insects where no arsenical residue problem is present. Among the insects that may be controlled are striped and spotted cucumber beetles, the asparagus beetle, Colorado potato beetle, flea beetles in plant beds and on newly set out plants in the field, and the squash vine borer.

The author reports that of all the insects that have been tested the corn ear worm is the only one which is decidedly resistant to derris.

Preliminary report on the fluorine compounds as insecticides, I. D. DOBROSCKY (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 627–637, figs. 5*).—In this contribution, presented with a list of 14 references to the literature, the author reports that "the fluorine compounds, and particularly natural cryolite, were found to be quite specific in the control of the tobacco flea beetles (*Epitrix parvula* Fabr. and *E. cucumeris* Harris), the eggplant flea beetle (*E. fuscula* Crotch), and the Mexican bean beetle (*Epilachna corrupta* Mul.). In field tests natural cryolite showed up as 2 to 2.5 times as effective as magnesium arsenate against the Mexican bean beetle. Feeding experiments with the confused flour beetle (*Tribolium confusum* Duval) showed that natural cryolite is more toxic than lead arsenate at the lower concentrations. Lime is incompatible with natural cryolite. Feeding experiments with bees showed that the toxicity of cryolite was markedly decreased by the addition of lime. The toxicities of the fluorine compounds studied were in close correlation with the amount of fluorine present and available in a solution or suspension."

A bibliography on the use of hydrocyanic acid gas as a fumigant, R. J. WILMOT (*Florida Sta., 1935, pp. 110*).—The literature relating to hydrocyanic acid gas fumigation is here brought together, the arrangement being by authors. A list of United States patents concerning hydrocyanic acid and cyanides relating to pest control, prepared by R. C. Roark, is included (pp. 107–110).

The mole crickets of Egypt (Orthoptera-Gryllotalpidae) [trans. title], A. CABBAB (*Bul. Soc. Roy. Ent. Égypte, 27 (1934), No. 4, pp. 421–426, pl. 1*).—Two species of *Gryllotalpa*, namely, *G. gryllotalpa* L. and *G. africana* P. de B., are described and illustrated in colors.

The use of colored light in electrocuting traps for the control of the grape leafhopper, W. B. HERMS and J. K. ELLSWORTH (*Agr. Engin., 16 (1935), No. 5, pp. 183–186, figs. 9*).—This is a progress report of the first year's tests of colored-light-using electrocuting-traps. The field tests, the details of which are given in tabular form, lead the authors to conclude that a sufficient number of grape leaf hoppers were removed daily by one trap to the acre, placed at intervals of about 200 ft., so that the few insects remaining on the vines were of no consequence. In addition to perfecting a positive control of the leaf hopper, the insect electrocutors proved of great value in the control of such insects as the moths of the corn ear worm and the army worm. It is thought probable that the successful operation of the installations in the five vineyards at Delano in northern Kern County, Calif., here reported, will establish the light-electrocution method as one of the primary methods of control for the grape leaf hopper in California vineyards.

In the course of the work several colored lights of different intensities were utilized in order to secure the most efficient device. The lights were turned on every night at 6 o'clock and turned off in the morning at 6 by an automatic switch. The trap employed consisted primarily of "a wire cage some 8 in. in diameter, the alternate wires being connected to the terminals of a transformer which thus supplies the voltage necessary for the electrocution of the insects. The quality of the porcelain insulation, the manner in which the transformer is embedded in its box, and the protecting cover for the trap assure freedom from difficulty even during rainy weather. The luminescent tube used as a lure is suspended along the axis of the wire cage to insure that the insect comes in contact with the wires as it flies toward the light. The durability and low operating cost over a period of years is dependent upon freedom from corrosion of the metal parts and the life of the luminescent tube. The electrocuting wires are of stainless steel, and the luminescent tube has a proved life of more than 10 yr."

There was found to be a marked increase in the number of hoppers, almost twice as many, attracted to the 60-w midnight blue tube (704) as compared with the Mazda lamp of the same intensity (399). Again, when the catch from the 120-w pale blue tube (4,631) is compared with the catch from the 60-w midnight blue tube (1,780), a doubling of the intensity as well as a slight change in the color was found to bring about an almost threefold increase in numbers.

The work was conducted by the California Experiment Station with the cooperation of the Southern California Edison Company, Ltd., and under the patronage of the California Committee on the Relation of Electricity to Agriculture.

The periodical cicada in West Virginia, W. E. RUMSEY (*West Virginia Sta. Circ. 70 (1935), pp. 8, figs. 5*).—In this account of the occurrence and control of the periodical cicada it is pointed out that a brood would appear in considerable numbers in the southern part of the State the latter part of May 1935 and that another brood, the largest in the United States, will occur in 26 counties of West Virginia with dense swarms in the eastern Panhandle the last of May 1936.

Preliminary studies on starvation and drowning of the chinch bug (Blissus leucopterus (Say)), M. J. JANES, A. HAGER, and G. E. CARMAN (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 538–546, figs. 5*).—In studies at the Iowa

Experiment Station chinch bugs were found to live for a considerable period of time without food or water. Death occurred sooner at high temperatures or low relative humidities. In every case insects having access to distilled water or to solutions of sucrose lived longer than the controls. An appreciable daily weight loss accompanied starvation. Chinch bugs were able to recover in some cases after submergence in water for as long as 48 hr.

Habits and control of chinch bugs, R. HUTSON (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 147–149, figs. 2*).—A brief practical account.

The balsam woolly aphid in the Northeast, H. J. MACALONEY (*Jour. Forestry, 33 (1935), No. 5, pp. 481–484, fig. 1*).—The balsam woolly aphid *Adelges piceae* Ratz. is well established throughout the range of balsam fir in New England. No control measures applicable to large areas are at present known, and where balsam fir forms an appreciable part of the stand severe infestation will greatly reduce the value of the crop.

Preliminary experiments on control of the pea aphid in the Northwest, J. E. DUDLEY, JR. (*Canning Trade, 57 (1935), No. 40, pp. 20–22*).—The author reports having found the dragging method for pea aphid control to be effective under the conditions obtaining in eastern Washington, as tested in the vicinity of Dayton in the aphid outbreak in 1934. In the majority of the acreages treated the aphid mortality ranged from 80 to more than 95 percent and is thought to have averaged above 90 percent. It is pointed out that this method of pea aphid control depends upon the following conditions: (1) A considerable proportion of the ground must be exposed to sunshine, (2) the ground must be dry and preferably with a dust mulch, and (3) the sun must be shining and the temperature at the soil surface must be at least 120° F.

The olive parlatoria, Parlatoria oleae Colvée, in Arizona, I, II (*Arizona Sta. Tech. Bul. 56 (1935), pp. 201–235, figs. 15*).—This contribution is presented in two parts.

I. *Life history and ecology,* A. A. Nichol (pp. 201–221).—The olive parlatoria, *P. oleae* (*P. affinis* Newst.; *P. calianthina* Berl. and Leonardi), here considered, is a scale insect of foreign origin, only once before reported in the United States, namely, by McConnell in 1930 from privet in Baltimore, Md. (E. S. R., 63, p. 459). For many years this scale remained a pest of 5 species of plants, but a long series of milder winters, commencing in 1924, seemingly has produced physiological changes in many plants in the area, resulting in their becoming acceptable hosts to the scale. In the Tucson area, where it is thought to have been introduced in 1891, it has been found on 41 species, representing 17 families. Of these, 22 species belong to the rose and olive families (Rosaceae and Oleaceae). The scale breeds upon at least 25 of these. The pest concentrates generally on midribs of leaves and stem and blossom ends of fruit. On different host plants it quite consistently selects specific areas for location. On olives, small twigs, midribs, and fruit are preferred; on *Elaeagnus*, only the upper surfaces of the leaves; and on pears and apples, the fruit and depressed areas in the bark. The study reported relates particularly to the humidity and temperature conditions responsible, the details being given in tables and figures. The prophecy is made that the epidemic nature of the pest will subside as Tucson winter temperatures return in a series of years to normal or below.

II. *Economic significance and control,* L. P. Wehrle (pp. 222–234).—Investigations conducted during the summer of 1932 of the local distribution, host plants, eradication, and control of this insect are reported. The host relation findings are noted above. In control work with this pest, which is widely distributed in the Tucson area, it was found that defoliation and spraying is not

a feasible method for eradication. "Large olive trees which were not defoliated required 15 to 25 gal. of oil emulsion for each tree. Oil emulsion was more effective against this coccid located on the leaves than when located on the fruits. One application of 4 percent oil emulsion gave 95.16 percent mortality. Two applications of 3 percent oil emulsion gave 81.06 percent mortality. Two applications of oil emulsion at somewhat uncertain strengths ranging between 2 and 4 percent gave 84.45 percent mortality. These studies indicate that *P. oleae* can be controlled by spraying with oil emulsion."

A list is given of 15 references to the literature.

The Coccidae of Greece, particularly of Pelion (Thessaly).—I, Diaspinae, J. Koronéos (*Les Coccidae de la Grèce, surtout du Pélion (Thessalie).—I, Diaspinae. Athênai (Athens): Author, 1934, pp. VII+95, pls. 78, fig. 1*).—Descriptions of the diaspine coccids, with their hosts and occurrence, are accompanied by illustrations. One genus is erected, 4 new species and 2 new subspecies are described, and 3 forms are renamed.

A summary of studies on arsenical substitutes for cabbage worm control on cabbage and limitations on arsenical treatments, W. H. White (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 607–609*).—Work with substitutes for arsenicals and limitations on arsenical treatments in combating cabbage worms (the imported cabbage worm, the cabbage looper, the diamondback moth, and the cabbage webworm) is briefly summarized.

The gypsy moth situation in Pennsylvania, A. F. Burgess (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 26–30*).—The status of the gypsy moth infestation discovered near Pittston, Pa., in July 1932 is reported upon as of August 1934.

Biological and ecological factors in the control of the celery leaf tier in Florida, E. D. Ball, J. A. Reeves, B. L. Boyden, and W. E. Stone (*U. S. Dept. Agr., Tech. Bul. 463 (1935), pp. 56, figs. 26*).—In the course of their study during the seasons of 1925, 1926, and 1927 of the sudden and unprecedented increase in the numbers of the greenhouse leaf tier that took place in the Sanford, Fla., celery-producing area in 1923 and 1925 (E. S. R., 68, p. 356), the authors detected an extremely complicated biological complex involving 2 host plants for leaf tiers, 3 parasites, several birds, 2 diseases, and a number of predators, all intimately associated in an unstable balance largely influenced by temperature factors.

The three most important factors, arranged in order of importance, were temperature fluctuation from the normal, increase of the egg parasite *Trichogramma minutum* Riley, and work of the migratory birds wintering in the region or on their way north in the spring. "The factors entering into the natural balance were able to reduce the numbers of the celery tier to a minimum in normal seasons, but when one warm winter season followed another the tier was able to increase to injurious numbers. When there were three warm winter seasons in succession the damage was extremely severe. A study of winter temperatures indicated that such a combination would very rarely occur.

"The proper use of pyrethrum dusts, with the applications so timed as to utilize the activities of the swallows in catching the moths, controlled even the worst outbreaks."

A list is given of 13 references to the literature.

Observations on the biology of the greater wax moth (Galleria mellonella L.), V. G. Milum and H. W. Geuther (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 576–578*).—The authors record observations of the life history of the wax moth not commonly given in the literature to add to or corroborate the observations of others. In addition to the wax moth, they have found that

in Illinois dry brood combs when stored at room temperatures may commonly be infested with the larvae of the Indian-meal moth, especially if a few dead bees are in the combs. No serious damage appears to result from such infestation.

Control of the western peach and prune root-borer, D. C. MOTE (*Oregon Sta. Circ. 109 (1935), pp. 6, figs. 4*).—A practical account of the western peach borer and its control.

The biology of *Holcocera pulverea* Meyr. (Blastobasidae), its predators, parasites, and control, M. P. MISRA and S. N. GUPTA (*Indian Jour. Agr. Sci., 4 (1934), No. 5, pp. 832–864, pl. 1, figs. 4*).—This contribution relates to the moth *H. pulverea*, one of the most injurious found associated with lac in India.

The citrus-leafminer *Phyllocnistis citrella* St., A. D. VOÛTE (*Dept. Econ. Zaken [Dutch East Indies], Korte Meded. Inst. Plantenziekten, No. 19 (1934), pp. 38, figs. 12; Eng. abs., pp. 37, 38*).—This contribution has been noted from another source (E. S. R., 73, p. 77).

Cutworm control in Oregon, B. G. THOMPSON (*Oregon Sta. Circ. 111 (1935), pp. 6, figs. 4*).—A practical account of the life history, habits, and control of cutworms in Oregon.

Two minor pests of young mango shoots (*Chlumetia transversa* and *Bombotelia jacosatrix*) [trans. title], A. D. VOÛTE (*Landbouw [Buitenzorg], 10 [1935], No. 7, pp. 255–271, figs. 2; Eng. abs., pp. 270, 271*).—The noctuid *C. transversa* Walk., a rather common minor pest of mango shoots, and *B. jacosatrix* Gn., a leaf feeder that has been observed damaging the young leaves of mango trees, in Java, are considered.

Preparation and use of chemically treated codling moth bands, F. SHERMAN III (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 150–152, figs. 2*).—A practical account dealing with the materials and the dipping and application of bands.

The codling moth and its control, C. R. CUTRIGHT and T. H. PARKS (*Ohio Agr. Col. Ext. Bul. 148 (1934), pp. 16, figs. 8*).—A practical account.

[Contributions on the codling moth and its control] (*Ohio State Hort. Soc. Proc., 67 (1934), pp. 90–109, fig. 1*).—The contributions presented include the following: General Review of the Codling Moth Situation, by J. S. Houser (pp. 90–96) and The Experimental Program against Codling Moth in 1933, by C. R. Cutright (pp. 96–103), both contributed from the Ohio Experiment Station; and Experiences in Removal of Arsenical and Lead Spray Residues, by W. S. Hough (pp. 104–109), contributed from the Virginia Experiment Station.

Codling moth control program in the Shenandoah-Cumberland fruit region, W. S. HOUGH (*Jour. Econ. Ent., 28 (1935), No. 3, p. 614*).—A brief statement.

Present status of codling moth control in Ohio, T. H. PARKS (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 612, 613*).—A brief consideration of the status of the codling moth in Ohio.

The codling moth situation in Pennsylvania, H. E. HODGKISS (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 609–612*).—A brief presentation of the Pennsylvania situation.

The destruction of mosquitoes in airplanes.—A preliminary note, C. L. WILLIAMS and W. C. DREESSEN (*Pub. Health Rpts. [U. S.], 50 (1935), No. 20, pp. 663–671*).—It has been found that "carboxide is not a suitable fumigant to kill mosquitoes in airplanes, either in flight or on the ground, because the containers are too heavy and the amount of material necessary to kill an effective percentage of *Aedes aegypti* is too large. A concentrated oil extract of pyrethrum flowers containing 2 g of pyrethrins per 100 cc is highly effective against *A.*

aegypti when brought in contact with them in the form of a very fine spray, the lethal concentration apparently being somewhere between 2 and 4 g per 1,000 cu. ft. Mosquitoes fumigated with either carboxide or pyrethrum extract do not die at once. It must remain for future experimentation to determine whether they are rendered incapable of biting before dying. The small amount of concentrated pyrethrum extract required to kill mosquitoes should render this material suitable for the destruction of these mosquitoes on airplanes in flight. It is the general belief that neither the pyrethrins nor the oil in which they are dissolved is harmful to human beings."

Mosquito control work of today, F. C. Bishopp (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 620–627*).—A brief outline of the present status of mosquito control.

The effect of heat and atmospheric humidity on all stages of *Culex fatigans*, P. V. Karamchandani (*Rec. Malaria Survey India, 5 (1935), No. 1, pp. 23–38, figs. 10*).—Following an account of methods of breeding and of manipulation, a study of the effect of heat and humidity on the egg, larva, pupa, and adult is reported.

The dispersion of anopheline larvae by the flow of streams, and the effect of larvicides in preventing this, J. A. Sinton and S. A. Majid (*Rec. Malaria Survey India, 5 (1935), No. 1, pp. 5–17*).—It was found that incredibly large numbers of living anopheline larvae may be carried along by the current of streams if conditions be favorable. Even in the presence of numerous larvicidal fish, aquatic vegetation and floating debris may protect large numbers of such larvae from destruction, and this drifting of larvae may have a very serious effect in disturbing the results of antimosquito measures. The drifting of larvae into a controlled area can be greatly diminished by a continuous application of oil, as by the use of oil balls. Paris green has a rapid killing action upon larvae drifting in the area dusted, but its effects are of comparatively temporary duration, and if used in a routine fashion every 5 days or so this method of destruction of drifting larvae would appear to be relatively ineffectual under the conditions of the experiment.

On a new phorid-fly infesting our edible mushroom, C. Sasaki (*Imp. Acad. [Japan] Proc., 11 (1935), No. 3, pp. 112–114, figs. 5*).—The dipteran here described as *Ophiochaeta matsutakei* n. sp. is said to cause considerable loss by the attack of the larvae on the edible mushroom *Armillaria matsudake*.

The Syrphidae of the Japanese Empire and neighboring territory [trans. title], T. Shiraki (*Mem. Faculty Sci. and Agr., Taihoku Imp. Univ., 1 (1930), pp. XX+446, figs. 100*).—Three hundred and two forms are recognized by the author, among which are many species described as new.

Species of Peruvian fruit flies of the genus Anastrepha Schiner (Trypetidae) [trans. title], J. Wille (*Min. Fomento., Dir. Agr. y Ganadería [Peru], Informe No. 27 (1934), pp. 12, figs. 10*).—A descriptive table given for the identification of *Anastrepha* fruit flies met with in Peru is adapted from the work of Greene (E. S. R., 71, p. 818).

The screw worm, T. L. Bissell (*Georgia Sta. Bul. 189 (1935), pp. 11, figs. 6*).—A practical summary of information on the screwworm (*Cochliomyia americana* Cush. and Patton) (E. S. R., 71, p. 226), which first appeared in Georgia in Thomas County in the summer of 1933 and by the end of 1934 had spread to Clarke and Cobb Counties, or over all but the northern fourth of the State. The number of cases of screwworm injury to animals in the State during the 2 yr. is estimated at 575,000 with probably 75,000 deaths, costing livestock owners about $2,500,000. Methods of treatment and control are given, including plans of a chute and brake for use in treating wounded or screwworm-infested animals.

Studies on the higher Diptera of medical and veterinary importance: A revision of the genera of the subfamily Calliphorinae based on a comparative study of the male and female terminalia, W. S. Patton (*Ann. Trop. Med. and Parasitol., 29 (1935), No. 1, pp. 19–32, figs. 10*).—This continuation of the work previously noted (E. S. R., 72, p. 815) deals with the genus *Calliphora* Robineau-Desvoidy (sens. lat.), giving a practical guide to the Australian species.

The May beetle in Württemberg, E. Welte (*Der Maikäfer in Württemberg. Stuttgart: Eugen Ulmer, [1934], pp. [216], pl. 1, fig. 1*).—This is a report of studies of the occurrence of *Melolontha* in various districts of Württemberg, the details being given in 63 appended tables, presented with a list of 47 references to the literature. It is accompanied by an attached map which shows the incidence of occurence in this State and Hohenzollern from 1920.

The Japanese beetle outbreak in St. Louis, Mo., and its control, C. W. Stockwell (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 535–537*).—A brief account of the occurrence of the Japanese beetle in St. Louis, Mo., where it was first collected in June 1932 and now appears to be confined to some 117 blocks, largely residential, but including a few business blocks and vacant lots. A large-scale control campaign is under way.

Trees and the white grub menace, P. O. Ritcher and C. L. Fluke, Jr. (*Jour. Forestry, 33 (1935), No. 6, pp. 620, 621*).—In this brief contribution from the Wisconsin Experiment Station (E. S. R., 65, p. 452), attention is called to the fact that where oaks are wanting and replaced by other hosts little damage to pastures and cornland occurs. Four species of June beetles, *Phyllophaga fusca*, *P. rugosa*, *P. hirticula*, and *P. tristis*, cause most of the damage in that State to pastures and cornlands.

Tree borers and their control, D. C. Mote (*Oregon Sta. Circ. 110 (1935), pp. 6, figs. 4*).—A brief practical account of the flat-beaded borers (the flat-headed apple-tree borer and the Pacific flat-headed borer), the shot-hole borer *Anisandrus pyri* Peck, and the bronze apple tree weevil or dead bark beetle *Magdalis aenescens* Lec.

Studies on Lema oryzae Kuwayama, the rice leaf-beetle.—IV, Observations on the biology and liberation of an egg-parasite, Anaphes nipponicus Kuwayama, S. Kuwayama (*Hokkaido Agr. Expt. Sta. Rpt., 33 (1935), pp. 1–80 +1–4, pls. 4, figs. 10; Eng. abs., pp. 1–4*).—This continuation of studies previously noted (E. S. R., 69, p. 560) deals with an egg parasite of *L. oryzae* which plays an important part in its control in Hokkaido, Honshu, and Taiwan (Formosa).

The Javanese beetle Plaesius javanus: Predator of banana borer introduced from Fiji (*Agr. Gaz. N. S. Wales, 46 (1935), No. 1, pp. 18, 30, fig. 1*).—Notes are presented on *P. javanus*, a histerid predator of the banana root borer, which has been introduced into New South Wales from Fiji by T. McCarthy.

Contribution to the study of the development and of the morphology of some Elateridae (Coleoptera), E. Guéniat (*Contribution à l'étude du développement et de la morphologie de quelques Elatérides (Coléoptères). Thesis, École Polytech. Féd. Zürich, 1934, pp. 133, figs. [67]*).—An introduction and general account are followed by a discussion of the biology and a report of observations of the life history and habits of adults in cages, including *Agriotes obscurus*, *A. lineatus*, *A. sputator*, and *Lacon murinus*. A report on the rearing of the larvae of these species, their morphological differentiation, and a bibliography of 80 titles follow.

An introduced anobiid beetle destructive to houses in the Southern States, T. E. Snyder (*Biol. Soc. Wash. Proc., 48 (1935), pp. 59, 60, pl. 1*).—

Notes are presented upon *Nicobium hirtum* Ill., long established in the Gulf States, which has recently been shown to be the cause of numerous reports of serious injury to woodwork in houses. It is most commonly found damaging old, well-seasoned furniture. In September 1934 it was found at New Orleans, La., and Palatka, Fla. Its range now extends northward to South Carolina and Virginia.

Wood borers in Australia, I–III (*Aust. Council Sci. and Indus. Res., Div. Forest Prod., Trade Circs. 6 (1931), pp. 14, figs. 5; 11 (1932), pp. 14, figs. 4; 25 (1934), pp. 11, figs. 5*).—The several parts of this contribution deal with (1) *Lyctus* spp., or the powder-post beetles, (2) *Anobium* spp., or the furniture beetles, and (3) pinhole borers, also known as "shot-hole borers" or "ambrosia beetles."

The eucalyptus snout beetle: Extent to which different kinds of Eucalyptus are attacked, F. G. C. TOOKE (*Farming in So. Africa, 10 (1935), No. 109, p. 174*).—It is pointed out that the introduction of the mymarid egg parasite *Anaphoidea nitens* into the Union of South Africa from Australia some 7 yr. previously has been most effective in controlling the ravages of *Gonipterus scutellatus* in the western and southern Cape Province and along the seaboard of the eastern Cape Province, the Transkei, and Natal. Thus far it has failed to survive in the high veld areas of the Union. A list is given of several groups of *Eucalyptus*, those (1) not recommended because of severe attack, (2) attacked to a certain extent in some localities and not in others, (3) so slightly attacked that there seems little risk in planting them, and (4) apparently immune to beetle attack.

Experiments in the control of boring insects, C. C. HAMILTON (*Natl. Shade Tree Conf. Proc., 10 (1934), pp. 31–36*).—Information on the development of a tree borer paint for use against the cambium bark borers *Cryptorhynchus lapathi* L. and *Euzophera semifuneralis* Walk., based upon preliminary work in 1932 (E. S. R., 71, p. 69) largely with various fractions of pine oils alone or mixtures of these pine oils with each other or with vegetable oils to each of which mixtures 5 percent of a 95 percent free nicotine and 5 percent paraffin were added, is contributed from the New Jersey Experiment Stations. The results are reported in detail in two tables.

Rice weevil control, F. A. SQUIRE (*Agr. Jour. Brit. Guiana, 6 (1935), No. 1, pp. 4–10, pls. 4*).—Control experiments with calcium carbonate and sodium fluosilicate have shown little difference in cost and effectiveness when used against the rice weevil.

Observations on a weevil injurious to banana, W. E. HOFFMANN (*Hong Kong Nat., 4 (1933), No. 1, pp. 48–54, figs. 5*).—An undetermined species of *Odoiporus* that resembles the banana root borer and attacks all species and varieties of bananas and plantains grown in Kwangtung Province, China, is described and noted.

Thomas Lincoln Casey and the Casey Collection of Coleoptera, L. L. BUCHANAN (*Smithsn. Misc. Collect., 94 (1935), No. 3, pp. IV+15, pl. 1*).—The Casey collection of beetles in the National Museum here reported upon is said to contain 19,245 named forms, with a total of 116,738 specimens, and more than 9,200 holotypes. The foreword is by A. Wetmore.

Further observations on the flight range of the honeybee in relation to honey production, A. P. STURTEVANT and C. L. FARRAR (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 585–589, fig. 1*).—Investigations carried on near Powell, Wyo., during 1931 and 1932, in continuation of those conducted by Eckert during 1927–29 (E. S. R., 70, p. 368), in which a larger number of colonies were used, are reported, the details being given in table and map form.

Studies in bee activity during apple bloom, W. H. BRITTAIN (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 553–559, fig. 1*).—In continuation of earlier studies (E. S. R., 70, p. 478; 71, p. 516), the author takes up methods of bee counting, the species involved, population studies, and bee activity in relation to climatic factors.

Airplane dusting and its relation to beekeeping, J. E. ECKERT and H. W. ALLINGER (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 590–597, fig. 1*).—This contribution reports at some length upon a typical case of bee poisoning resulting in the experimental apiary at the University of California from airplane dusting in July of 251 acres of tomatoes with 4,300 lb. of calcium arsenate, the details being given in tabular form. This is followed by a consideration of the manner in which bees may get the poison, and some of the effects; the collection and analysis of samples; the results of the arsenic determinations; and the emergency measures to prevent or mitigate injury to bees.

Some effects of relative humidity on the length of life and food consumption of honeybees, A. W. WOODROW (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 565–568, fig. 1*).—This is a report of a preliminary experiment conducted at Ithaca, N. Y., during the winter of 1933–34.

Bee-eating proclivities of the striped skunk, T. I. STORER and G. H. VANSELL (*Jour. Mammal., 16 (1935), No. 2, pp. 118–121, fig. 1*).—Notes on the bee-eating habit of the striped skunk (*Mephitis occidentalis occidentalis*), based largely upon observations in the apiary at the University of California at Davis, are presented. The fence used to surround an apiary to protect against skunks is described and illustrated, since this animal is able to, and does at times, climb fences of wire mesh.

The effect of certain bactericides, especially copper sulphate, on the longevity of honeybees, E. M. HILDEBRAND and E. F. PHILLIPS (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 559–565*).—The proposal to apply certain bactericides to the open blossoms of the pome fruits in an attempt to prevent infection by the fire blight organism (*Erwinia amylovora*) led to the tests here reported of the effects on bees, the details of which are presented in tabular form.

It is concluded that the minimum lethal dose cannot be accurately determined from experiments of the kind conducted, since the bees can ingest more than the minimum lethal dose prior to the occurrence of death. The stronger copper sulfate solutions caused a more rapid death rate than occurred with water alone, hence it is concluded that copper sulfate in such amounts is either poisonous to the bees, or that it disturbs their physiological processes, or that both things occur. Since the total amount of food ingested per bee per day was decreased when copper sulfate was added to the sugar solution, it is concluded that the bactericide acts as a repellent to bees. At the greater dilutions of copper sulfate there was no significant shortening of life, however, and it is concluded that such minute amounts are not poisonous although acting as a repellent. Lime alone did not shorten life but it decreased the consumption per bee per day. The zinc-lime mixture with sugar solution acted much as did lime.

Resistance of honeybees to American foulbrood, R. G. RICHMOND (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 597–601*).—The author's studies here reported, made of some 16 colonies of bees established west of Fort Collins, Colo., in Rist Canon, indicate that it may be possible to secure a strain of bees which will be resistant in some measure to American foul brood.

Studies on the bacteria associated with parafoulbrood, C. E. BURNSIDE and R. E. FOSTER (*Jour. Econ. Ent., 28 (1935), No. 3, pp. 578–584, fig. 1*).—In a further study of parafoulbrood (E. S. R., 69, p. 580), the authors have found

a variety of morphologically different bacterial forms to occur in sick larvae. "Changes in form of bacterial cells appear to occur as disease progresses, coccus, coccoid, and rod-shaped cells changing to lancet shapes. Cultures from affected larvae usually yield sporogenic *B[acillus] para-alvei*. Many cultures also yield a coccoid form which resembles *Streptococcus apis*. *B. para-alvei* is present in brood and stores in affected colonies. It was not found in healthy colonies or colonies with other disorders. Under natural conditions parafoulbrood is very infectious. It is difficult to transmit to brood kept in an incubator.

"*B. para-alvei* shows marked variability. Several 'variants' were observed in these experiments, some of which were isolated and stabilized. Two of the variants resemble morphologically bacteria in sick larvae. Cultures of coccoid organism (similar to *S. apis*) obtained in cultures from sick larvae also show considerable variability. On rare occasions cultures produced a sporogenic bacillus indistinguishable from sporogenic *B. para-alvei*. Other morphological changes also occurred, depending upon the medium."

Thus it is concluded that the evidence at hand points to a pleomorphic bacterium, of which *P. para-alvei* is a stage in the life history, as the etiological factor in parafoulbrood.

The cause of dysentery in honeybees, E. C. ALFONSUS (*Jour. Econ. Ent.*, *28 (1935), No. 3, pp. 568–576*).—In contributing from the Wisconsin Experiment Station, it is reported that "dysentery of honeybees is caused by excess moisture in the feces. This excess of moisture is due to the consumption of dilute food or water. It is generally produced by crystallization of the stores; this divides the honey or sirup into a solid crystalline portion and a liquid portion. The liquid portion contains an excess quantity of moisture. Pollen, dextrin, minerals, burned sugar, and fermenting sirup do not produce dysentery. Chilling and disturbing honeybees may cause defecation, but do not produce dysentery in a healthy colony. Long confinement of bees during the winter as well as a short confinement on unripe honey produces dysentery. Water alone or dilute sirups produce dysentery in bees if absorbed during confinement. Dysentery appears when the fecal accumulations reach 33 percent of the total body weight of the bees. General defecation does not take place until the accumulation reaches about 45 percent."

Experimental studies in insect parasitism.—III, Host selection, G. SALT (*Roy. Soc. [London], Proc., Ser. B, 117 (1935), No. 805, pp. 413–435, fig. 1*).—In this further study (E. S. R., 71, p. 216) "ovipositing females of *Trichogramma evanescens* were observed to examine, select, and attack, besides a number of true hosts from which their progeny successfully emerged, several unsuitable hosts in which their progeny were unable to develop, and a variety of false hosts, such as particles of sand and globules of mercury, in which they were unable even to lay their eggs.

"Two strains of *Trichogramma* reared exclusively on *Sitotroga cerealella* and *Ephestia kuehniella*, respectively, for 63 and 43 generations, developed no dependence on or even preference for their respective hosts. Both of these strains preferred eggs of *Ephestia*, but . . . simply as the larger host. When two different kinds of hosts were simultaneously exposed to *Trichogramma*, in every case the parasite showed a preference for the larger of the two, even though the preferred host was in some cases unsuitable for the development of its progeny, in other cases a false host in which the parasite could not even lay its eggs.

"From this experimental analysis and from a review of the characteristics of objects accepted by *Trichogramma* as hosts, it appears that the principal criterion used by ovipositing females of *Trichogramma* in the selection of their

hosts is that of size. *T. evanescens* does not select its hosts on qualities of an indefinable nature, peculiar to certain species of animals, but uses criteria that can be defined in scientific terms."

Epimegastigmus brevivalvus Girault, a parasite of the citrus gall wasp Eurytoma fellis Girault, N. S. NOBLE (*Jour. Aust. Inst. Agr. Sci., 1 (1935), No. 1, p. 29*).—The habits of *E. brevivalvus*, a chalcidoid which deposits its eggs within those of its host (*E. fellis*), are briefly noted.

Prorops nasuta Waterston in Brazil [trans. title], A. HEMPEL (*Arch. Inst. Biol.* [*São Paulo*], *5 (1934), pp. 197–212, pls. 4, figs. 5; Eng. abs., p. 211*).—This contribution relates to a hymenopterous parasite of the coffee berry borer *Stephanoderes hampei* Ferr., introduced into Brazil from Uganda, east Africa, in June 1929. The parasite was easily acclimatized, and multiplied so rapidly during the first year that more than 30,000 specimens were distributed to 48 coffee plantations prior to September 30, 1930.

Some notes concerning the occurrence and the control of the citrus mites in Java [trans. title], A. D. VOÛTE and A. E. ZEILINGA (*Landbouw* [*Buitenzorg*], *10* [*1935*], *No. 8, pp. 292–301; Eng. abs., p. 301*).—Injury to fruits at Malang, Java, is said to be caused by a species of *Eriophyes* different from the citrus rust mite, and not by the red spider as formerly supposed.

Spraying experiments for the control of fruit-tree red mite (Paratetranychus pilosus C. & F.), J. LISTO ([*Finland*] *Valtion Maatalouskoetoiminnan Julkaisu.* (*Agr. Expt. Activ. State Pub.*), *No. 70 (1935), pp. 70, figs. 2; Eng. abs., pp. 52–62*).—Experiments with both winter and summer sprays in control of the European red mite in Finland are reported, and directions given for its control.

Notes on the Eriophyidae of Egypt (Acarina), AHMED SALEM HASSAN (*Bul. Soc. Roy. Ent. Égypte, 27 (1934), No. 4, pp. 440–444, figs. 3*).—Notes are presented on the pear leaf blister mite, fig mite, *Eriophyes cladophthirus* Nal., and *Phyllocoptes* sp., observed in Egypt.

Life history of Latrodectus mactans, A. W. BLAIR (*Arch. Int. Med., 54 (1934), No. 6, pp. 844–850, pls. 2*).—Observations of the biology of the black widow spider (*L. mactans*) are accompanied by a plate of colored illustrations. The study of this species, which is said to be the only proved poisonous spider found in the United States, and of which no complete study of the life history appears to have been made, was conducted in the vicinity of Tuscaloosa, Ala., during the 2 yr. preceding. Observations on its appearance, habitat, web, feeding habits, mating, egg sac, eggs, development, span of life, and danger to man are presented.

Spider poisoning: Experimental study of the effects of the bite of the female Latrodectus mactans in man, A. W. BLAIR (*Arch. Int. Med., 54 (1934), No. 6, pp. 831–843, figs. 4*).—In the experimental work with man reported, the author has found the venom injected by the bite of the adult female black widow spider (*L. mactans*) to be dangerously poisonous for man. "The development of the ensuing clinical picture may be divided into three stages, of which the second, that of shock, is the most critical. The sequence of symptoms following the injection of venom by *L. mactans* is sufficiently characteristic to entitle it to recognition as a clinical entity in the field of general medicine."

ANIMAL PRODUCTION

[Livestock investigations in Arizona] (*Arizona Sta. Rpt. 1934, pp. 10, 41–43, 89, 90*).—Data obtained in studies with beef cattle are reported on alfalfa hay as a supplement to hegari, nutritional deficiencies of Arizona range forages,

the feeding value of different grades of alfalfa hay, the economy of grain in the ration, ground hegari fodder and cottonseed meal for fattening beef steers, and the value of whole cottonseed as a feed for beef cattle.

With poultry, results were obtained on the effect of back-crossing and reciprocal crosses on egg production in the offspring, necessity of shade for poultry growth, and trench and tent brooding.

[Livestock investigations in Michigan] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 11, 19, 20, 43, 44, 51, 52*).—Information obtained in tests with swine is given on alfalfa meal as a protein supplement for brood sows, grinding wheat and barley for pigs, and variations in the number of ribs and vertebrae in swine together with observations on the economic significance of such variability.

With poultry, data were obtained on slipped tendon or hock disease of chickens, the value of barley as a substitute for corn in the rations of laying hens and baby chicks, the effect of artificial heat and ventilation on the egg production of pullets during the winter months, and a study of the different baby chick rations with special reference to the amounts consumed, the quality of proteins, and the mineral and vitamin requirements.

[Livestock investigations in Michigan], G. A. Brown, E. J. Miller, and C. G. Card (*Michigan Sta. Rpt. 1934, pp. 175–179, 203, 231*).—The results obtained in tests with beef cattle and horses are reported on methods of utilizing the corn crop for fattening steers, a comparison of steer and calf carcasses, and limited compared with liberal rations for the development of draft colts.

With swine, information was obtained in studies on skim milk for growing and fattening pigs, alfalfa meal as a protein supplement for brood sows, grinding wheat and barley for pigs, and corn and barley for pigs on pasture.

The sheep studies produced results on methods of self-feeding lambs, winter rations for breeding ewes, and winter rations for ewe lambs.

With poultry, results are reported on a study of the factors influencing the interior quality of eggs, a study of baby chick rations to determine the cause of perosis, the effect of artificial heat on laying pullets during the winter months, and the value of barley as a substitute for corn in the ration of laying hens and baby chicks.

[Investigations with livestock in New Hampshire] (*New Hampshire Sta. Bul. 284 (1935), pp. 11, 12, 23, 24*).—Data are reported from experiments on the optimum time for cutting timothy, by F. S. Prince and P. T. Blood; the comparative nutritive value of different varieties of hay for dairy cows, and the basal metabolism of a small pony, both by E. G. Ritzman and F. G. Benedict; and sheep breeding, by Ritzman, A. D. Littlehale, and N. F. Colovos.

In poultry studies, information was obtained on protein level requirements for growing chicks, by A. E. Tepper, F. D. Reed, and T. B. Charles; vitamin A requirements for growing chicks, by Tepper and Reed; and sardine oil v. cod-liver oil, by Tepper.

[Livestock investigations in Ohio] (*Ohio Sta. Bul. 548 (1935), pp. 68–74, 99, 100, 101*).—Data are reported on the effect of season and maturity on the composition of bluegrass, by C. H. Hunt and W. L. Robison.

Studies with swine dealt with oat byproducts for pigs, and hominy feed and wheat as substitutes for corn for pigs, both by Robison; and reducing the protein allowance for fall pigs at the Miami County Experiment Farm, by Robison and P. A. Jones.

In sheep tests, results were obtained on timothy hay as roughage for ewes, by D. S. Bell, L. E. Thatcher, Hunt, and C. H. Kick; pasturing wheat with sheep,

by Bell and Thatcher; and single v. twin lambs at the Southeastern Experiment Farm, by Bell and S. C. Hartman.

With poultry, information was obtained in studies on management of chicks and growing pullets, range v. confined layers, and studies of individual layers, all by D. C. Kennard and V. D. Chamberlain; effect of method of manufacture on the nutritive value of fishmeals for growth of chicks, and the effect of method of manufacture on the digestibility and biological value of fishmeal proteins, both by P. R. Record, R. M. Bethke, and O. H. M. Wilder; sources of vitamin A for chicks.—I, Comparison of carotene and vitamin A as found in cod-liver oil, and relation of the vitamin G complex to hatchability and nutritive value of the egg, both by Bethke and Record; and studies on quality of hays, by Hunt, Bethke, and Record.

Drouth feeds and rations, R. R. Thalman (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 173 [1935], pp. 6*).—This circular was prepared to answer questions pertinent to feeding problems, to acquaint feeders with feeds unknown to them, to compound these feeds into rations that would keep animals alive, and to give some of the nutritive requirements for farm animals.

Protein content of grasses, F. E. A. Leibbrandt (*Farming in So. Africa, 9 (1934), No. 103, p. 399*).—In analyses of four grass species, *Chloris gayana*, *Eragrostis plana*, *Themeda triandra*, and *Digitaria pentzii*, showing the protein content at the grazing, hay, mature, and frosted stages, the precentage was highest in the first stage.—(*Courtesy Biol. Abs.*)

Some preliminary feeding experiments with scabby barley, B. B. Mundkur (*Phytopathology, 24 (1934), No. 11, pp. 1237–1245*).—Feeding tests with hogs at the Iowa Experiment Station showed that 40 percent of scabby barley was distasteful and caused vomiting and slight intoxication. There were no other serious complications such as diarrhea or enteritis. Poultry fed on scabby barley did not show disease symptoms, although feeds containing it were not relished. Guinea pigs lost in weight when put on a half-and-half barley standard-mash diet, and while they lost more when the barley used was scabby, they did not become ill. Clean and scabby barley seemed to be equally distasteful to guinea pigs.—(*Courtesy Biol. Abs.*)

Ensilage experiments with the addition of acid [trans. title], E. Piraux (*Bul. Inst. Agron. et Stas. Rech. Gembloux, 3 (1934), No. 3, pp. 239–248; Dutch abs., p. 247; Ger. abs., pp. 247, 248; Eng. abs., p. 248*).—Trials with lucerne showed that methods of ensilage with addition of acid present a marked interest from the point of view of preservation, and allow a safe and inexpensive solution of the problem of cold ensilage of fodder rich in albuminoids with a minimum of losses. It is shown that the pH value of silage should be brought down below 4. Drainage did not appear to cause any noticeable alteration of fodder value. Inoculation with lactic ferment under operating conditions did not give satisfactory results.—(*Courtesy Biol. Abs.*)

Tankage as a protein supplement for cattle and lambs, R. R. Thalman (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 174 (1935), pp. 4*).—The circular summarizes the results obtained in feeding tankage to cattle at both the Ohio and Nebraska Experiment Stations (E. S. R., 68, p. 513).

Wheat straw as a roughage for fattening cattle, R. R. Thalman (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 152 [1935], pp. 5, fig. 1*).—Two lots of yearling steers were full-fed shelled corn and 1.5 lb. of cottonseed cake per head daily for 188 days. In addition, lot 1 received a roughage ration of equal parts of wheat straw and alfalfa hay, while lot 2 received wheat straw only. The average daily gains in the respective lots were 2.2 and 2 lb. per head. Lot 2 made the most economical gains, and since both lots sold at the same price made the greatest return.

Fattening beef steers on feeds produced in Hawaii, L. A. Henke (*Hawaii Sta., Anim. Husb. Div. Prog. Notes No. 10 (1935), pp. 8*).—In this test three 2-year-old steers were fed for 126 days on a concentrate ration made up of 27 percent of cane molasses and 36.5 percent each of pigeonpea hay meal and corncob and husk meal. With the addition of a small amount of roughage, the above ration produced average daily gains of 2.5 lb. per head. The animals consumed 10.2 lb. of the concentrate mixture per pound of gain. The average dressing percentages were 55.8, and all carcasses graded good or better.

Relative efficiency and profitableness of three grades of feeder steers, IV, P. Gerlaugh and C. W. Gay (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 38–40, fig. 1*).—Continuing this study (E. S. R., 70. p. 817), three lots of steers of choice, medium, and good grades, respectively, were fed for 211 days on a ration of shelled corn, protein supplement, silage, hay, and stover. The average daily gains in the respective lots were 2, 2, and 2.1 lb. per head.

The return per bushel of corn fed was $1.15, $1.39, and $0.92 in the respective lots. The common steers were most economical in their use of feed, but when finished lacked the quality demanded by the trade. The choice steers cost too much initially for their uniformity and their strictly choice appearance.

Relative efficiency and profitableness of three grades of feeder steers (summary of four years), P. Gerlaugh and C. W. Gay (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 41–44*).—This article summarizes the results of 4 years' tests with different grades of feeder steers, the last of which is noted above.

Pasture feeding v. dry lot feeding for half-fat and feeder steers, R. R. Thalman and H. J. Gramlich (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 138 [1935], pp. 10*).—In this test two lots of calves were wintered on rations of either shelled corn and alfalfa hay full-fed or corn silage and alfalfa for 150 days. At the end of this period the lots were subdivided, and one group from each lot was fed crushed shelled corn and alfalfa in dry lot while the other group received corn on pasture for 183 days in the case of the lots full-fed during the winter and 190 days for the feeder lots.

There was practically no difference in the gains of the cattle that had been full-fed during the winter. The feeder steers on grass gained 59 lb. more per head than those in dry lot but shrank more during shipment. In neither case was there any significant difference in the economy of gain between pasture and dry-lot feeding. Pasture feeding tended to stimulate the growth impulse more than dry-lot feeding, and the pasture-fed cattle were not so desirable from a slaughter standpoint.

Summer feeding two-year-old steers, yearling steers, and yearling heifers, wintered on silage and alfalfa, R. R. Thalman and H. J. Gramlich (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 139 [1935], pp. 9*).—Yearling steers, steer calves, and heifer calves were fed silage and alfalfa during a wintering period of 150 days, and then were fed corn on pasture for 190 days. During the wintering period there was practically no difference in the gains of the heifer and steer calves, but the former required less feed per unit of gain. The yearlings gained 35.6 percent more than the steer calves, but consumed about 40 percent more silage daily. During the finishing period the younger steers made average daily gains of 2.4 lb. per head, while the older steers and heifers gained approximately 2 lb. per head. The younger steers also made the most efficient gains, followed in descending order by the heifers and the older steers. The two latter lots sold for the same price, which was 25 ct. per hundredweight below that realized for the younger steers.

Shelled, ground shelled, and ground ear corn for fattening steers on pasture, R. R. Thalman and H. J. Gramlich (*Nebr. Univ., Anim. Husb. Dept.,*

Cattle Circ. 140 [*1935*], *pp. 6*).—In this test yearling cattle were fed for 190 days on pasture on rations of shelled corn, ground shelled corn, or ground ear corn. Shelled corn produced 13 lb. more total gain than ground shelled corn and 54 lb. more gain than ground ear corn. The evidence did not indicate that there was any advantage in feeding ground shelled or ground ear corn in place of shelled corn for steers being fattened on pasture.

Shelled corn v. cracked shelled corn, R. R. THALMAN and H. J. GRAMLICH (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 141* [*1935*], *pp. 5*).—Two lots of yearlings were fed for 130 days on a basal ration of alfalfa hay plus cottonseed cake. In addition lot 1 received shelled corn and lot 2 cracked shelled corn. The average daily gains were 2.8 and 2.6 lb. per head in the respective lots. Cracking the corn had no significant effect upon feed consumption. Lot 1 made the most efficient gains and produced the most pork. The net return per bushel of corn fed was 42 ct. in lot 1 and 30 ct. in lot 2.

(1) Atlas sorgo silage v. corn silage when supplemented with alfalfa, cottonseed cake, or cottonseed cake and limestone, for wintering stock calves. (2) Corn silage for wintering yearling steers and steer and heifer calves, R. R. THALMAN and H. J. GRAMLICH (*Nebr. Univ., Anim. Husb. Dept., Cattle Circ. 146* [*1935*], *pp. 13, figs. 4*).—In this test three lots of steer calves were fed corn silage supplemented with either alfalfa hay, cottonseed cake, or cottonseed cake plus 0.1 lb. of ground limestone. Three similar lots were fed Atlas sorgo silage with the same supplements. A lot of heifer calves received corn silage and 3 lb. of alfalfa hay, and a lot of yearling steers received silage plus 5 lb. of alfalfa hay per head daily. The average daily gains during a 150-day feeding period were 1.3, 1.7, 1.8, 1.1, 1.6, 1.6, 1.2, and 2 lb. per head in the respective lots.

Atlas silage, irrespective of supplement, produced approximately 90 percent as much total gain as corn silage. It produced 80 percent as much gain per ton of silage and 88 percent as much gain per pound of dry matter as corn silage. On an acre basis, however, Atlas silage produced 1,449 lb. of gain as compared with 683 lb. for corn silage. Substituting cake for hay as a supplement to silage increased the gains 21.8 percent with corn silage and 29.2 percent with Atlas silage. Adding limestone to cake increased the gains 9.5 percent with corn silage and 5.8 percent with Atlas silage. Heifer calves consumed approximately the same amount of feed as steer calves and gained 94.8 percent as much. Yearling steers gained 35.1 percent more than steer calves, but produced only 82.2 percent as much gain per ton or acre of silage fed.

Corn-and-cob meal versus shelled corn for yearlings and calves, P. GERLAUGH and H. W. ROGERS (*Ohio Sta. Bimo. Bul. 173* (*1935*), *pp. 34–37*).—In this test two lots of yearlings averaging 624 lb. per head initial weight were fed for 196 days, and two lots of calves averaging 387 lb. per head were fed for 294 days. All lots received approximately 1.6 lb. per head daily of protein supplement made up of cottonseed meal, tankage, and linseed meal 3 : 2 : 1, and the calves received one-half as much silage as the yearlings. One lot of each kind of cattle was fed corn-and-cob meal and the other shelled corn. The corn and hay were fed in such amounts as the cattle would clean up.

The average daily gains for the corn-and-cob meal lots were 2.5 and 2.1 lb. per head for the yearlings and calves, respectively, and for the shelled corn lots 2.4 and 2 lb. per head. The cattle consumed more corn grain when fed shelled corn, but the amount of feed required per unit of gain favored the corn-and-cob meal. More gain was obtained on the pigs following the cattle fed shelled corn than on those following the corn-and-cob meal groups. The latter lots had better appetites during hot weather than the shelled corn groups.

The use of wheat and rye for fattening calves, M. L. Baker (*Nebraska Sta. Bul. 295 (1935), pp. 16, fig. 1*).—The results are reported of a series of three feeding tests of 205, 194, and 196 days' duration on the value of wheat and rye for fattening calves. The trials were conducted at the North Platte Substation. Comparisons were made of ground wheat, ground rye, equal parts of ground wheat and shelled corn, equal parts of ground rye and shelled corn, and rolled or crushed wheat when fed with alfalfa hay.

While no difficulties were experienced in feeding ground wheat or ground rye, calves did not consume these feeds as readily as calves fed shelled corn or a mixture containing shelled corn. The best results were obtained when wheat or rye was coarsely ground with the alfalfa hay fed according to appetite. Calves fed wheat or rye ate more hay than those fed rations containing corn. While all rations produced satisfactory gains, those which included corn produced a somewhat better finish than the ground wheat ration and a markedly better finish than the ground rye ration. Calves on the corn rations required more grain but less hay per unit of gain than those fed wheat or rye as the sole concentrate. When fed as one-half of the grain ration both ground wheat and ground rye were entirely satisfactory from every standpoint. In one trial ground wheat proved to be superior to rolled or crushed wheat.

Fattening steer calves, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 30–34, fig. 1*).—Continuing this study (E. S. R., 70, p. 817), five lots of calves averaging approximately 400 lb. per head initial weight were fed for 304 days. All lots were full-fed shelled corn, and all received the same amount of silage and mixed clover and timothy hay. In addition lots 1, 3, and 4 received 0.8, 0.8, and 1.6 lb. per head daily of a mixture of dry rendered tankage, soybean oil meal, cottonseed meal, linseed meal, ground limestone, steamed bone meal, and salt 30 : 30 : 20 : 15 : 2 : 2 : 1, and lots 2 and 5, 1 and 2 lb., respectively, of a mixture of equal parts of linseed meal and cottonseed meal. Lot 3 also received 0.5 lb. of cane molasses per head daily.

The average daily gains in the respective lots were 2, 2, 2, 2.1, and 1.9 lb. per head. The tankage supplement had a favorable effect on feed requirements per unit of gain at both levels, but the higher level appeared to be superior from the viewpoint of rate of gain. The addition of molasses increased feed consumption, but did not increase the rate of gain. No difficulties were experienced in getting the animals to eat the tankage supplement, nor were there any harmful effects upon the carcass.

Adding supplement to corn for calves on bluegrass pasture, P. Gerlaugh (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 37, 38*).—Two lots of 10 calves each, averaging 442 lb. per head initial weight, were full-fed shelled corn on bluegrass pasture for 168 days. One lot received in addition 1 lb. of cottonseed meal per head daily. The average daily gains were 1.7 lb. per head in both lots, but the cost of a unit of gain was much greater in the lot receiving the protein supplement. No advantage was obtained in this test from the use of cottonseed meal.

Early and late lamb production, M. A. Alexander and A. D. Weber (*Nebr. Univ., Anim. Husb. Dept., Sheep Circ. 324 [1932], pp. 8*).—Western ewes fed grain before and after lambing gained almost twice as much as similar ewes fed grain after lambing and 3.5 times as much as ewes fed no grain. The lambs dropped in the first lot ate more grain and made larger gains than those in the other lots. Feeding grain after lambing did not cause the lambs to consume more feed but did stimulate milk production, causing the lambs to make larger gains than those from ewes fed no grain. The ewes heavily grained before and after lambing sold for 50 ct. per hundredweight more than those grained after

lambing, and for $1.85 more than those fed no grain. The market value of the lambs varied in direct proportion to the amount of grain fed the ewes.

Ewes fed grain on pasture after lambing gained 12 lb. more per head, and their lambs gained 6 lb. more than in the lots where no grain was fed. The increased finish also markedly increased the market value of the animals. Feeding lambs in dry lot during the latter part of the grazing season increased the gain and market value of the lambs.

There was little difference in the feed cost per ewe in lots where lambs were produced early and in lots where lambs were produced late. The final weight of the lambs produced at the different times was practically the same. The selling price of the early lambs was higher than that of the late lambs. If ewes cannot be grained before and after lambing, the results indicated that late lambing would be more desirable.

Linseed meal, cottonseed meal, and corn gluten meal compared in lamb fattening rations of calculated equal digestible crude protein and total digestible nutrients, M. A. Alexander (*Nebr. Univ., Anim. Husb. Dept., Sheep Circ. 325 [1932], pp. 4*).—In this test five lots of lambs were fed a ration of ground shelled corn and alfalfa hay for 87 days. In addition lot 2 received linseed meal, lot 3 corn gluten meal and cornstarch, lot 4 cottonseed meal and cornstarch, and lot 5 linseed meal and cornstarch. The corn ration was varied in accordance with the amount of calculated digestible nutrients added by the inclusion of the protein supplement. All lots made average daily gains of 0.35 lb. per head except lot 5, which gained at the rate of 0.34 lb. No fattening properties were shown by the rations containing a protein-rich feed that were not also exhibited by the corn and alfalfa ration.

Adding various protein supplements to a corn and alfalfa hay lamb fattening ration, M. A. Alexander and A. D. Weber (*Nebr. Univ., Anim. Husb. Dept., Sheep Circ. 326 [1933], pp. 7*).—This report is for an average of three trials in which eight lots of lambs were fed a basal ration of shelled corn and alfalfa hay. In addition the respective lots received the following supplements: None, linseed meal, cottonseed meal, corn gluten meal, equal parts of linseed meal and cottonseed meal, equal parts of linseed meal and corn gluten meal, equal parts of cottonseed meal and corn gluten meal, and equal parts of linseed meal, cottonseed meal, and corn gluten meal. The average daily gains in the respective lots were 0.28, 0.31, 0.31, 0.32, 0.31, 0.32, 0.31, and 0.32 lb. per head.

Corn gluten meal as a single supplement produced somewhat more rapid and economical gains than the other protein feeds. Various combinations of the supplements reduced the amount of variations in gains. One ton of a protein supplement had a replacement value of 31 bu. of shelled corn and 1.25 tons of good alfalfa hay. The feeds used had no effect on dressing percentage. No particular supplement or ration was outstanding in the grades of carcasses produced.

Efficient corn and alfalfa hay rations for fattening lambs, M. A. Alexander (*Nebr. Univ., Anim. Husb. Dept., Sheep Circ. 327 [1934], pp. 4*).—Eight lots of western lambs were fed rations differing in the amounts of corn and alfalfa hay fed. It was found that the number of days between the start of feeding and an expected favorable market should be a determining factor in the selection of a ration. The most rapid gains were made with a self-fed ration of equal parts of cracked corn and chopped alfalfa. This lot also had the highest mortality. As the allowance of corn increased, the daily gains increased regardless of the amount of hay fed. The time required for the different rations to produce 30 lb. of gain is given in tabular form.

Limited rations for pigs, V. A. FREEMAN (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 95–98*).—To determine the value of limited rations three lots of seven pigs each were fed a basal ration of ground corn, tankage, and ground alfalfa during the winter. One lot was self-fed, another received 3 percent of their body weight of the above feed daily, and the third lot 2 percent of their body weight. The last lot made unprofitable gains, requiring 1,149 lb. of feed per 100 lb. of gain, almost three times as much as the self-fed lot. The pigs fed the 3 percent ration required 50 lb. more feed per 100 lb. of gain than the self-fed lot and gained at the rate of 0.7 lb. per head daily as compared with 1.1 lb. for the self-fed lot. The pigs were weighed out when they reached 180 lb. in weight, which required 110 days in the self-fed lot and 187 days on the 3 percent ration. After 134 days the pigs in the 2 percent ration group had failed to gain appreciably and were placed on a self-feeder. During a 63-day period they gained at the rate of 1.6 lb. per head daily and required only 313 lb. of feed per 100 lb. of gain.

In a second trial six lots of three pigs each were fed. The first lot was self-fed the above mixture in dry lot; lot 2 was self-fed corn and alfalfa hay; lot 3 received 3.5 percent of the mixture fed in lot 1; lot 4, 2.5 percent; lot 5, 2.5 percent on alfalfa pasture; and lot 6, 2.5 percent of shelled corn on alfalfa pasture. During a 112-day period the average daily gains in the respective lots were 1.5, 0.9, 0.9, 0.5, 0.8, and 0.7 lb. The feed required per 100 lb. of gain was 383, 582, 363, 447, 304, and 357 lb. in the respective lots.

At the end of the above feeding period the lots were continued for another 5-week period, using the same rations in lots 1 to 4, while lot 5 was self-fed the mixture used in lot 1, and lot 6 was self-fed corn with access to alfalfa hay. The average daily gains during this period were 2.1, 1, 1.6, 0.6, 2.1, and 1.7 lb. per head in the respective lots, and the feed required per 100 lb. of gain was 519, 717, 403, 633, 356, and 468 lb.

Ground oats and hull-less oats in hog rations, W. J. LOEFFEL (*Nebr. Univ., Anim. Husb. Dept., Hog [Circ.] 242 [1933], pp. 2*).—In this test three lots of 12 pigs were self-fed shelled corn and tankage on Sudan grass pasture for 79 days. In addition lot 2 was self-fed hull-less oats for 2 weeks and then 1 lb. per head daily, while in lot 3 ground oats were self-fed for 2 weeks and then hand-full-fed. After 56 days the oats were discontinued. The average daily gains were 1.5 lb. per head in all lots, and the amount of feed required per unit of gain was practically the same. Both types of oats as used in this test were entirely satisfactory.

The effect of certain supplementary feeds upon the production and firmness of pork (*Nebr. Univ., Anim. Husb. Dept., Hog [Circ.] 243 [1933], pp. 4*).—Ten lots of pigs averaging 74 lb. per head were self-fed rations of ground corn supplemented with tankage or mixtures of varying proportions of tankage, linseed meal, ground soybeans, soybean oil meal, cottonseed meal, corn gluten meal, peanut meal, and alfalfa meal until each lot averaged 225 lb. At this time the lots were killed and graded for firmness. There was considerable variation within lots in firmness, but none of the byproducts used or even 6 percent of soybeans exerted any serious softening effect upon the lard. Hams and bacon from all lots when cured and smoked were satisfactory as to firmness.

Fattening pigs on Sudan grass pasture, W. J. LOEFFEL and E. B. LEWIS (*Nebr. Univ., Anim. Husb. Dept., Hog [Circ.] 244 [1933], pp. 4*).—In this test 8 lots of 85-lb. pigs were full-fed on Sudan grass pasture for 110 days. The following rations were used: Corn and tankage, corn, corn plus 0.25 lb. of tankage, cracked barley and tankage, cracked barley, ground corn and ground

oats 3:1 plus tankage, ground corn and ground oats equal parts plus tankage, and corn, shorts, and tankage. The average daily gains in the respective lots were 1.6, 0.8, 1.3, 1.5, 1, 1.6, 1.5, and 1.6 lb. per head.

Adding tankage self-fed to a corn ration increased the feed consumption and almost doubled the rate of gain. The addition of 0.25 lb. of tankage also increased feed consumption and increased the daily gain 50 percent. Cracked barley and tankage were more palatable than corn and tankage, but were not as efficient in producing gains. When fed alone the barley produced larger gains but was less efficient than corn alone. Adding 1 part of ground oats to 3 parts of corn produced as good gains as corn and tankage, but the oats were worth only 50 percent as much as corn on a weight basis. Equal parts of corn and oats reduced the rate of gain, but in this proportion oats were two-thirds as valuable as corn. Each 100 lb. of shorts fed saved 72 lb. of corn and 7 lb. of tankage. When no tankage was fed the pasture was destroyed by rooting in spite of the self-feeding of a mineral mixture.

Growing pigs on Sudan grass, W. J. LOEFFEL and E. B. LEWIS (*Nebr. Univ., Anim. Husb. Dept., Hog [Circ.] 245 [1935], pp. 2*).—A 60-day test was conducted with 4 lots of 69-lb. pigs fed on Sudan grass pasture as follows: Corn and tankage self-fed, 2 lb. of corn per head daily, 1.8 lb. of corn and 0.2 lb. of tankage, and 2 lb. of ground barley per head daily. During the last 14 days it was necessary to feed alfalfa hay in the last 3 lots because the pastures had been killed by chinch bugs. The average daily gains in the respective lots were 1.6, 0.5, 0.5, and 0.4 lb. per head. The full-fed pigs required only 80 percent as much grain per unit of gain. Adding 10 percent of tankage to a light ration of corn did not increase the rate or efficiency of gain. The ground barley was only 85 percent as efficient as the corn.

[Rib and vertebra variation in swine], H. R. HUNT (*Michigan Sta. Rpt. 1934, p. 240*).—Data as to the numbers of vertebrae in different breeds of swine are reported as collected by V. A. Freeman.

[Poultry investigations in Maine], W. F. DOVE (*Maine Sta. Bul. 377 (1934), pp. 369–374, fig. 1*).—Experiments yielded data on the uropygial gland of birds and vitamin D assimilation, and determining the time of embryonic mortality from the position of the embryo (domestic fowl).

Decrease in hemoglobin following hatching, A. D. HOLMES, M. G. PIGOTT, and P. A. CAMPBELL (*Poultry Sci., 14 (1935), No. 3, pp. 183–189, figs. 4*).—This study was undertaken to determine the hemoglobin content of the blood of Rhode Island Red chicks during the first 3 weeks of life. It was found that there was a high initial hemoglobin level and a rapid decrease during the first 5 to 7 days of life. Following this period the hemoglobin rose somewhat and remained at a fairly constant level for the next 2 weeks. There was little difference in the hemoglobin level of the blood of Rhode Island Red and Barred Plymouth Rock chicks of the same age and history. The blood of chicks bled every 5 days showed a higher hemoglobin content than that of comparable birds bled 3 times weekly. In order to interpret accurately the significance of hemoglobin determinations for young chicks it was necessary to know the age and history of the chick. There appeared to be a correlation between the peak of mortality, the rate of absorption of egg yolk, and the initial drop in hemoglobin. The fifth to seventh day appeared to be a critical period in the life of young chicks.

A flexible, workable poultry breeding improvement program, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 22 (1934), No. 1, pp. 4, fig. 1*).—A suggested breeding program is given in chart form, providing for operations both at the home farm and away from that farm.

A method of analyzing the data of chick nutrition experiments, H. W. TITUS and J. C. HAMMOND (*Poultry Sci., 14 (1935), No. 3, pp. 164–173*).—Continuing this series of papers (E. S. R., 73, p. 371), a method of analyzing the data on chick nutrition experiments, known as the method of "weighted squares of means", is presented. By using this method it is possible to obtain accurate measures of the reliance that may be placed in observed experimental differences in growth, bone ash, perosis, egg weight, pellagra, and other factors. By suitable application to the principle of regression, the method can be applied to data on egg production and hatchability.

Testis stimulating potency of frozen turkey pituitaries injected subcutaneously into young male chicks, T. C. BYERLY, W. H. BURROWS, and H. W. TITUS (*Poultry Sci., 14 (1935), No. 3, pp. 189, 190*).—In this work by the U. S. D. A. Bureau of Animal Industry, pituitaries removed from the heads of turkeys killed for market in the usual way were placed in a few cubic centimeters of water, macerated, and injected beneath the skin of the cervical region of the host chicks. Pituitaries were also removed from four cockerel heads with a history similar to the turkey heads and injected into a host chick as a check. Other checks were chicks injected with water and untreated.

The data showed a marked response in weight of testes for the host chicks. Although the cockerel pituitaries were smaller than turkey pituitaries, the weight of the testes of the single host chick that received four cockerel pituitaries was greater than the weight of the testes of the chick receiving eight turkey pituitaries but less than the average weight of the host chicks which received a total of 20 turkey pituitaries each.

The relative vitamin G content of dried whey and dried skimmilk, V. HEIMAN (*Poultry Sci., 14 (1935), No. 3, pp. 137–146*).—This investigation at the [New York] Cornell Experiment Station was based on the hypothesis that dried whey contained approximately 1.5 times as much vitamin G as dried skim milk. In preliminary work it was found that the important phases of the vitamin G complex in milk were the growth-promoting (hatchability-promoting) and antiparalytic phases. The relationship of the amount of vitamin G in the ration to resulting growth was established and a formula deduced to calculate the relative vitamin G content of dried skim milk and dried whey, using the vitamin G content of the skim milk as unity and expressing the results as a vitamin G ratio. Repeated assays showed that the actual vitamin G ratio of the dried skim milk to dried whey was quite close to 1 : 1.5. Further substantiation of the hypothesis was found in the fact that cheese made from the same milk as the comparable milk byproducts contained only very small quantities of vitamin G that could be accounted for by the normal whey content of cheese.

The egg production of pullets on a vitamin G-deficient diet was approximately normal. The hatchability of eggs produced was significantly higher in a group fed a suboptimum level of dried whey than in a like group on a similar level of dried skim milk. The growth rate of chicks on vitamin G-deficient diets hatched by pullets fed dried whey and dried skim milk was roughly proportional to the hatchability results. The vitamin G content of eggs produced and the greenish-yellow pigment of the white was directly proportional to the vitamin G content of the ration. Dried egg whites were relatively richer in vitamin G than dried yolks. There was a larger amount of lactochrome, the greenish-yellow water-soluble pigment of milk, in dried whey than in dried skim milk, and the quantity present was correlated with growth response and hatchability.

A practical ration containing dried whey as the chief source of vitamin G that would produce satisfactory growth results was worked out. Dried skim

milk could be used to replace the whey in this ration if the proper adjustments were made.

Reducing protein concentrates in rations of chicks at different ages, R. E. Roberts and C. W. Carrick (*Poultry Sci., 14 (1935), No. 3, pp. 156–163*).—Investigations at the Indiana Experiment Station showed that with the basal rations used chicks could be fed for 4 weeks on relatively high protein rations and then changed to rations with lower protein content without making important differences in the weights at 12 weeks of age. There were practically no differences in the amount of feed required per unit of gain with the different rations, and the differences in mortality could not be attributed to the rations fed.

Effects of common feed ingredients on the iodine content on hen's eggs, H. J. Almquist and J. W. Givens (*Poultry Sci., 14 (1935), No. 3, pp. 182, 190*).—In a test at the California Experiment Station six lots of birds were fed rations containing varying amounts of iodine furnished by different combinations of common feed ingredients. The respective diets furnished 50, 250, 300, 335, 184, and 210γ of iodine per 100 g of feed. The average eggs produced in the respective lots contained 3, 42, 60, 41, 50, and 51γ of iodine per egg. Production, average egg weight, shell texture, shell thickness, and percentage of firm white were essentially the same for groups 1 and 2 while on the standard laying ration and while on the test rations. There was no significant difference in the hatchability of the eggs produced by the two lots, but the average iodine content of chicks at 21 days of incubation was 2.9γ for lot 1 and 15.3γ for lot 2. Chicks from these lots were divided into two groups, one of which received a ration composed of iodine-low ingredients and the other the same ration supplemented with 0.05 percent of potassium iodide. The growth response was practically identical in both groups.

It was felt that the use of marine products in poultry rations more than adequately met the demands of the hen. There was no close relation between the iodine content of the ration and the iodine content of the egg.

Vitamin A content of eggs as related to rate of production, M. C. Koenig, M. M. Kramer, and L. F. Payne (*Poultry Sci., 14 (1935), No. 3, pp. 178–182*).—At the Kansas Experiment Station a study was undertaken to determine the vitamin A content of the yolks of eggs laid by high- and low-producing pullets, some beginning and some ending the first year of production. Rats were used to test the vitamin A potency of the eggs produced.

It was found that both high- and low-producing young pullets nearing the end of the first 4 mo. of production laid eggs of similar vitamin A content, at least 25 units per gram. Near the end of the first year of production, however, eggs from low producers contained 33 units of vitamin A per gram of yolk as compared with about 20 units for the high-producing group. Pale eggs produced on a ration free from carotene and xanthophyll but supplied with vitamin A in the form of cod-liver oil contained 25 units of vitamin A per gram.

The cooling of eggs, E. M. Funk (*Missouri Sta. Bul. 350 (1935), pp. 15, figs. 8*).—A series of investigations was undertaken to determine the temperature changes that take place in eggs held in different containers and at various temperatures.

Eggs that had an initial temperature of from 92° to 102° F. held in an egg room at 50° and cooled to below 68° required 1 hr. for a single egg to reach this temperature, 3 hr. for an egg in the center of three layers of eggs on a wire tray, 5 hr. in the center of a wire basket, 10 hr. in the center of a galvanized pail, 15.5 hr. in the center of a chilled case, and 15 hr. in the center of a warm case. Eggs held in similar containers in a household refrigerator cooled more

rapidly because the difference in temperature between the egg and the surrounding air was greater. Circulating the air in the refrigerator or egg room hastened the rate of cooling, especially when the eggs were held on a wire tray or in a wire basket. Eggs in chilled cases cooled more rapidly than those in warm cases.

The general laws of cooling apply to cooling eggs, and certain values could be used for estimating the decrease in temperature of eggs in the different containers and at various temperatures. These values, however, applied only to a specific set of conditions. In order to prevent an increase in the temperature of eggs it is desirable to chill cases and case liners and to have insulation before packing the eggs.

A rapid method of finding the costs of egg production, W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 22 (1935), No. 3, pp. 4, fig. 1*).—A chart is presented by means of which a reasonably accurate estimate of the costs of egg production may be readily determined.

Feeding and management of broilers, D. C. Kennard (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 61–67*).—In this article the author suggests some procedures relative to the finish feeding and management of market broilers. The results of several tests indicated that liquid skim milk and condensed buttermilk were of equal value, while dried buttermilk was less effective in producing gains during the finish feeding period. Soybean oil meal properly supplemented with minerals proved to be comparable to liquid skim milk. Incubator eggs, including infertile, dead germ, and "dead in shell" eggs, made a valuable substitute for milk. The highest percentage gain was obtained with the youngest and smallest cockerels.

Notes are appended on how to prepare and feed incubator eggs, rations for cockerels, and methods of feeding.

Broiler production for the egg farmer, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 22 (1935), No. 4, pp. 4*).—The advantages, costs, returns, feeding, care, and management of broilers as a side line to the production of market eggs are discussed.

Seven years of pullet rearing in New Jersey, L. M. Black (*New Jersey Stas. Hints to Poultrymen, 22 (1935), No. 2, pp. 4*).—The results of a 7-yr. campaign against the parasites and diseases of poultry are discussed. The results show that by strict adherence to a sanitary program the chick mortality has decreased and the number of good pullets housed increased.

The influence of the presence of cockerels in the flock upon the development of pullets, F. M. Fronda and E. P. Enriquez (*Poultry Sci., 14 (1935), No. 3, pp. 174–177*).—At the University of the Philippines it was found that the average weight of pullets at 32 weeks of age was 1,276.1 g per bird in a lot containing no cockerels, 1,206.6 g in a lot of 50 pullets and 10 cockerels, 1,189.1 g in a lot of 50 pullets and 25 cockerels, and 1,098.6 g in a lot of 50 pullets and 50 cockerels. The pullets in lot 1 matured in 177.4 days, those in lot 2 in 185.5 days, in lot 3 in 193.5 days, and in lot 4 in 200.2 days. The average weight of the males at 32 weeks of age was 1,504.1 g in lot 2, 1,352.5 g in lot 3, and 1,308.6 g in lot 4. Although statistical treatment of the probable errors of the differences of the above figures showed no significant differences, the trends are of interest.

It was observed that most of the pullets in lot 1 were gentle, healthy, and vigorous, while those in the other lots were wild and flighty. Both in the yard and in the poultry house the cockerels caused considerable trouble, especially when they were 6 to 7 mo. old.

The effect of temperature and position in the incubation of turkey eggs, J. H. Martin and W. M. Insko, Jr. (*Poultry Sci., 14 (1935), No. 3, pp. 152–154*).—In tests with a sectional incubator at the Kentucky Experiment Station, the highest hatchability with turkey eggs was obtained when the average temperature was 100.5°, 101.4°, 102.6°, and 103° F. the first, second, third, and fourth weeks, respectively. A temperature of 101° throughout did not give as high hatchability, and a temperature above 103° the last week increased the embryo mortality for that week.

Hatching turkey eggs large end up in a forced-draft incubator did not increase the hatchability and required extra labor at hatching time to save the poults. There was no advantage gained by utilizing only half the space in hatching trays of a forced-draft incubator when eggs were resting on their sides.

Calcium and phosphorus requirements of growing turkeys, F. E. Mussehl and C. W. Ackerson (*Poultry Sci., 14 (1935), No. 3, pp. 147–151, figs. 5*).—In studies at the Nebraska Experiment Station, it was found that growing poults were able to adjust themselves to a rather wide variation of the calcium-phosphorus ratio with the basal rations used if the most favorable conditions for calcium and phosphorus assimilation and fixation were provided. Some factor other than the calcium-phosphorus ratio had a physiological effect on the assimilation of the minerals. When vitamin D and ultraviolet energy were withheld from the ration and environment, poults receiving a high level of calcium appeared to be better able to adjust themselves to the vitamin limitation. Apparently the calcium and phosphorus requirements varied according to the growth rate, which was influenced by the quantity and quality of protein as well as by factors other than vitamin D. On the basis of these results it was concluded that the calcium and phosphorus requirements must be determined for each basal ration if accuracy is required.

DAIRY FARMING—DAIRYING

[Dairy investigations in Arizona] (*Arizona Sta. Rpt. 1934, pp. 49, 50*).—Data are reported on the effect of stages of maturity of hairy Peruvian alfalfa on milk production, and physiological varieties of bacteria in milk at the time of reduction in the methylene blue reduction test.

[Dairy cattle and dairy products investigations in Michigan] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 22–25*).—Test with dairy cattle yielded information on the effect of a simple ration of alfalfa hay, corn, and bone meal on milk production; the effect of a simple ration of corn, oats, or barley with alfalfa hay and bone meal on the growth of dairy heifers; sun-cured alfalfa hay as a potent source of vitamin D for dairy cows; the vitamin D-sparing action of magnesium; prevention of rickets in calves by the use of irradiated milk; the difficulties encountered in raising calves from birth to maturity on milk alone; feeding concentrates alone to ruminants; the effect of feeding raw crushed cottonseed meats to dairy heifers; the dairy enterprise in Michigan from a farm management point of view; and the effect of a simple grain v. a complex grain mixture for body weight, general health, lactation, and reproduction of dairy cattle.

With dairy products results were obtained in tests on homogenization of milk, the effectiveness of several proposed stabilizers in ice cream, comparison of daily v. 10-day and 15-day composite tests of milk, and the effect of heating the Babcock tester on resulting tests.

[Dairy cattle investigations in Michigan] (*Michigan Sta. Rpt. 1934, pp. 203, 204, 206, 207*).—Data obtained with dairy cattle are reported on a chemical study of the blood and excreta of dairy animals, by E. J. Miller; the relation of magnesium, phosphorus, and vitamin D in the ration of dairy cattle, the effect of a simple grain v. a complex grain mixture on body weight, health, lactation, and reproduction of dairy cattle, the effect of low v. high protein grain mixtures with pasture on body weight, health, lactation, and economy of production of dairy cows, a farm management study of the dairy enterprise in Michigan, feeding concentrates only to ruminants, and the homogenization of milk, all by E. L. Anthony.

[Investigations with dairy cattle and dairy products in Ohio] (*Ohio Sta. Bul. 548 (1935), pp. 57–65, 74, 97, figs. 2*).—Experiments with dairy cattle yielded information on the development of nutritional anemia in dairy calves, by C. E. Knoop, W. E. Krauss, and R. G. Washburn; the relation of vitamin A deficiency to nerve degeneration, by T. S. Sutton, Setterfield, and Krauss; the vitamin A content of corn silage, by Krauss; silage as the only roughage, by C. F. Monroe and C. C. Hayden; ensiling of apple pomace, by A. E. Perkins and Monroe; Sudan grass pasture, and wheat pasture for dairy cows, both by Monroe and L. E. Thatcher; the proportion of protein needed in the grain mixture fed with pasture, by Perkins; fishmeal in the dairy ration, by Monroe, Krauss, and Hayden; palatability of grain mixtures, by Monroe and Krauss; the influence of the feed of the cow upon the vitamin G content of the milk, by C. H. Hunt and Perkins; and heavy hay rations in reducing grain needs at the Trumbull County Experiment Farm, by Monroe and H. Allen.

With dairy products, data were obtained in studies on the copper and iron content of milk throughout the year, by Krauss and Washburn; a comparative study of the vitamin A content of butterfat from four breeds of dairy cattle, by Sutton and Krauss; carotene for coloring butter, by Sutton and R. B. Stoltz; vitamin D milk, by Krauss and R. M. Bethke; and the nonprotein nitrogen of cow's milk, by Perkins.

Dry feed systems of raising calves, W. E. Krauss, C. F. Monroe, and C. C. Hayden (*Ohio Sta. Bimo. Bul. 175 (1935), pp. 45–51*).—A series of three tests was undertaken with Holstein calves to determine a satisfactory system of raising dairy calves on dry feed in sections where fluid milk is sold. Various methods were compared with the system originated by the New Jersey Experiment Stations (E. S. R., 61, p. 561).

The results showed that skim milk powder could be substituted pound for pound for soluble blood flour. A level of 12.5 percent of skim milk powder in the grain mixture was almost as efficient and much more economical than a level of 29 percent. Calves fed liquid skim milk in the usual way were outstandingly superior in appearance throughout, grew faster at less cost per unit of gain in weight, and their skeletal growth was also superior. Increasing the intake of whole milk plus a greater consumption of grain did not improve the rate of growth or the physical appearance of the calves. There was no evidence that the solubility of the dried blood was a factor in the feeding of calves. Whitefish meal and dry rendered tankage offered possibilities as satisfactory sources of protein in this system of raising calves.

Appended is information as to the cost of the various rations, a suggested schedule for dry feeding, and cautions to be observed.

Effect of heating milk on the time which the curds remain in the abomasum of calves, F. N. Mortenson, D. L. Espe, and C. Y. Cannon (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 229–238, figs. 4*).—The Iowa Experiment Station used

calves with gastric fistulas to determine the reaction of the calf's digestive system to heat-treated milk. The effect of heating on curd tension was also studied.

Boiling skim milk for 3 min. in an open container on an oil bath lowered the curd tension about 80 percent. Pasteurizing skim milk at 142° F. for 30 min. lowered the curd tension about 20 percent, while autoclaving at 242° for 15 min. reduced the curd tension to zero. Plain condensed skim milk diluted to the specific gravity of average skim milk had a curd tension near that of boiled milk.

By palpating the curd mass in the abomasum through the wall of the rumen it was found that 2 l of raw skim milk when fed by a stomach tube usually left the abomasum in about 12 to 18 hr. The evacuation time for the same quantity of boiled milk and autoclaved milk was about 8 to 12 hr. It was found by removing curd through a gastric fistula at varying intervals that equal amounts of raw and boiled milk were liquefied at about the same rate for the first 3 to 6 hr., but after this period the boiled milk liquefied faster.

In calves fed the test meals of equivalent amounts of raw and heat-treated milk it was found that boiled and autoclaved milk left the stomach more quickly than raw milk. This was believed to be due to the lower curd tension on the heat-treated milk, which permits the curd to break up more easily and furnishes a greater surface for the gastric juice to attack. Raw skim milk coagulated in the stomach of the calf in from 1 to 10 min., while heat-treated milk coagulated in from 8 to 15 min. Individual variations were found with the same type of test meal fed under nearly identical conditions.

The relation of vitamin D to calcium and phosphorus retention in cattle as shown by balance trials, G. C. Wallis, L. S. Palmer, and T. W. Gullickson (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 213–228, fig. 1*).—In this investigation at the Minnesota Experiment Station 10-day mineral balance trials were used for directly measuring the calcium and phosphorus retention of, first, normal calves and, later, of young, growing calves on rations relatively low in calcium and phosphorus and deficient in vitamin D. Prairie hay was used as the roughage for one group and beet pulp for the other. The concentrate portion of the ration included corn, corn gluten meal, oats, cornstarch, and a little wheat bran. Some rations were supplemented with either calcium, phosphorus, calcium and phosphorus, cod-liver oil, or sunshine.

It was found that the average calcium and phosphorus retention of vitamin D-deficient calves could be increased 14 times in the case of calcium and 11 times in the case of phosphorus by the administration of vitamin D. Increasing the mineral content of the ration of vitamin D-deficient calves had no favorable influence on mineral retention. In this work the average daily retention of normal calves was approximately 6.5 g of calcium and 3.25 g of phosphorus. For such calves the calcium and phosphorus retention was approximately a 2:1 ratio regardless of the mineral content of the ration. The ratio of retention was the same for calves suffering from a vitamin A deficiency. These results indicated a marked interrelationship between the two elements and suggested that a shortage of either may act as a limiting factor in retention of the other.

It was found that prairie hay may carry appreciable amounts of vitamin D, but that beet pulp possesses little if any of this factor. Young, growing calves under favorable conditions may store vitamin D for later use as a protection against a deficiency for a varying length of time. Uncomplicated aphosphorosis did not develop when all sources of appreciable amounts of vitamin D were eliminated from rations otherwise similar to those which ordinarily caused this condition. Vitamin D acted to improve the mineral retention of

calves suffering from a rachiticlike syndrome within at least 3 to 7 weeks after its administration.

A study of the influence of thyroxin on milk secretion, E. L. Jack and S. I. Bechdel (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 195–206, figs. 5*).—This study at the Pennsylvania Experiment Station was undertaken to determine the effect of intravenous thyroxin injections upon the quantity and composition of milk secreted by dairy cows. Two Brown Swiss cows were injected alternately over three 28-day periods at a rate calculated to increase the basal metabolic rate by 10 percent. Two Holstein cows were given injections at 7-day intervals for 3 weeks at a rate designed to increase the basal metabolic rate by 30 percent. The quantity of milk secreted was weighed, and in the case of the first two cows samples were analyzed for specific gravity, weight of milk fat produced, and percentages of milk fat, lactose, protein, solids-not-fat, lactalbumin, and lactoglobulin.

Injections of 25 mg of thyroxin resulted in an increase in milk secretion. The injections were most effective just previous to the last few weeks of the lactation period. They had little effect at the peak of production and scarcely any significant effect at the extreme end of the lactation period. The composition of the milk was not significantly altered by the injections.

Fat-soluble vitamins.—XLI, The carotene and vitamin A content of colostrum, J. Semb, C. A. Baumann, and H. Steenbock (*Jour. Biol. Chem., 107 (1934), No. 3, pp. 697–703*).—Continuing this series of investigations (E. S. R., 73, p. 133), it was found that the carotene and vitamin A content of butterfat prepared from colostrum was from 5 to 15 times greater than that of fat prepared from ordinary milk. These values were obtained from cows of five different breeds on a diet relatively low in carotene.

These factors of the butterfat decreased rapidly during the first week of milk secretion, but further decrease was relatively slow. Changes in the carotene content of the butterfat could not be attributed to changes in the carotene content of the blood plasma. Increasing the carotene intake increased the level of blood plasma carotene. The breeds that produced butterfat high in carotene content showed a relatively high blood plasma carotene concentration. Only 0.8 percent of the plasma carotene was secreted into the milk daily.

Seasonal variations in the lipase content of milk, J. L. Hileman and E. Courtney (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 247–257, fig. 1*).—This investigation was undertaken to determine the extent to which lipase was present in mixed milk as received at commercial cream plants in New York State, with special reference to seasonal variations.

It was found that the increased acidity, with accompanying bitter flavors occurring at certain seasons of the year in raw cream that had been held for some time at icebox temperatures, was due to lipase activity. The lipase was secreted by the cows with the milk. The lipase content of milk was at a minimum in early summer and reached a maximum in early winter, but some lipase was present throughout the year. The amount of lipase increased as the lactation period was prolonged. An unknown factor also governed the amount of lipase secreted.

The determination of curd tension by the use of hydrochloric acid-pepsin coagulant, D. Miller (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 259–265*).—The U. S. D. A. Bureau of Dairy Industry undertook a series of studies to determine the suitability of hydrochloric acid in place of calcium chloride in the coagulating medium used in determining the curd tension of milk.

An excess of calcium chloride in a coagulant containing calcium chloride and pepsin retarded coagulation and produced a subnormal curd tension. The results of these studies indicated that a coagulant of 0.45 g of pepsin per 100 cc of 0.4 percent hydrochloric acid produced a truer picture of the curd character and simulated the gastric conditions more than one containing calcium chloride. Boiling for 1 min. softened the curd of all milks, but not to the same degree. The curd tension of the calcium chloride coagulant of boiled Jersey milk showed only a slight softening, but there was a marked drop when it was coagulated with the acid.

The percentage increase or decrease of curd tension of Holstein, Jersey, and goat raw milk treated in various ways was practically alike when tested by the acid coagulant. On the other hand, the calcium chloride coagulant on the same milks produced effects of greater percentage increase or decrease in curd tension readings.

Upper Peninsula well water an excellent medium for cooling milk and cream, G. W. Putnam (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 159–161*).—The temperature of water available for milk and cream cooling in the Upper Peninsula was determined by making temperature readings throughout the year over a period of 2 yr. In most cases it was found that the well water was of sufficiently low temperature to cool fluid milk and cream adequately, but some system of holding the temperature such as the addition of ice may be necessary during hot weather. The winter temperatures of the water were approximately 4° F. cooler than the summer temperatures. There was no relationship between the depth of the well and the temperature of the water.

The germicidal efficiency of lye and chlorine solutions for the sterilization of milking machines and cream separators, A. C. Fay, W. J. Caulfield, and W. H. Riddell (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 239–245, fig. 1*).—The Kansas Experiment Station compared results obtained with lye (sodium hydroxide) and chlorine (sodium hypochlorite) solutions used in the sterilization of milking machines and cream separators.

The results showed that milking-machine tubing and teat cups could be effectively sterilized with chlorine solutions testing 100 p. p. m. available chlorine, or 0.3 percent lye solution, if the solution rack method was used. The chlorine solutions were less satisfactory than the lye solutions when the immersion method was used.

As a disinfectant rinse for separators, chlorine solutions were more effective than lye solutions. To insure efficient sterilizing action chlorine solutions should contain at least 200 p. p. m. of available chlorine. There was little difference in the bacteriological efficiency of lye solutions testing 1, 0.75, and 0.5 percent, respectively. Lye solutions of 0.5 percent tended eventually to corrode the surface of separator disks, and for this reason it should not be recommended for cream separators.

Relation of the proteolytic enzyme activity to the proteolytic organisms found in separator slime, G. Spitzer and E. H. Parfitt (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 267–272, fig. 1*).—At the Indiana Experiment Station investigations were conducted to study the relation of the activity of the proteolytic enzymes in separator slime to the numbers of proteolytic organisms present.

It was found that the activity of these enzymes was greater during the summer months than during the winter months. There was a relation between the numbers of proteolytic organisms in the slime and its proteolytic enzymatic activity. About 70 percent of the proteolytic enzymatic activity of the slime was inactivated by heating at 145° F. for 30 min. or at 165° for 10 min.

Methods of increasing the vitamin D potency of dairy products, W. E. Krauss and R. M. Bethke (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 52–60*).—This article brings up to date the methods used for increasing the vitamin D content of milk noted in a previous publication (E. S. R., 69, p. 574).

Factors affecting economical manufacture, uniformity in composition, and quality of butter, D. H. Nelson (*Jour. Dairy Sci., 18 (1935), No. 4, pp. 207–211, figs. 2*).—This paper from the California Experiment Station reviews the records of the "Butter Standardization Laboratory." The review showed that it was not only desirable but practical for the butter manufacturer to so control overrun that the fat content of the butter always falls between 80 and 81 percent. In order to do this it was necessary to use not only the moisture test but also the Kohman method for analyzing each churning.

Bacteriology of cheese.—I, Effect of pasteurizing the milk on the nitrogenous decomposition in Cheddar cheese, C. B. Lane and B. W. Hammer (*Iowa Sta. Res. Bul. 183 (1935), pp. 353–382, fig. 1*).—This investigation on the effect of pasteurizing milk on the nitrogenous decomposition in Cheddar cheese was carried out with nine series of cheeses. Six of the series contained two cheeses made at the same time from equal portions of the same milk, but one was made from raw milk and the other from pasteurized milk. The other three series contained three cheeses, one made from raw milk, one from pasteurized milk, and one from 90 percent pasteurized milk and 10 percent raw milk. Changes in the nitrogen distribution were determined by chemically analyzing the cheese serum for total nitrogen, amino nitrogen, and various nitrogen fractions which were soluble or insoluble in trichloroacetic acid, ethyl alcohol, phosphotungstic acid, or tungstic acid, at intervals during ripening.

In all cheeses the increase in the various nitrogen fractions indicated a steady breakdown of the proteins. During the early stages of ripening there was little variation in the amounts of the various fractions in the serum of raw- and pasteurized-milk cheese, but after longer ripening the amounts of the fractions were definitely higher in serum of the raw-milk cheese, indicating a more rapid and extensive breakdown of the proteins of such cheese. After 2 mo. of ripening the flavor scores were regularly higher in the cheese made from raw milk, while that made from pasteurized milk was characterized by a lack of flavor and a tough rubbery body.

The amounts of nitrogen fractions in the serum of cheese made from the mixed pasteurized and raw milk were usually intermediate between the corresponding values for the other cheeses. The mixed-milk cheese developed a flavor essentially the same as that of the raw-milk cheese. The serum from high quality cheese made from either raw or mixed milk was characterized by the relatively large quantities of nitrogen fraction soluble in trichloroacetic acid but insoluble in ethyl alcohol. Relatively small amounts of the fraction were insoluble in trichloroacetic acid.

Practical ice cream making and practical mix tables, A. D. Burke (*Milwaukee, Wis.: Olsen Pub. Co., [1935], pp. 212*).—This treatise was prepared to convey a knowledge of those basic facts and fundamentals which will enable the production of a high quality ice cream. Incorporated in the book are formulas for making various kinds of ice cream and ice creams of varying compositions.

Twentieth annual report of the creamery license division, T. H. Binney (*Indiana Sta. Circ. 208 (1934), pp. 16*).—This is the usual report of the State creamery license division, for the year ended March 31, 1934 (E. S. R., 71, p. 90), and deals with the comparative annual production of dairy products in Indiana, the creamery inspection, and the examination of testers.

VETERINARY MEDICINE

[Work in animal pathology at the Arizona Station] (*Arizona Sta. Rpt. 1934, pp. 9, 44, 45, 48, 49, 90*).—Work with livestock affections under way during the year briefly referred to (E. S. R., 70, p. 825) includes studies of losses of cattle in southern limestone ranges due to mountain-mahogany (*Cercocarpus* sp.) and catclaw (*Acacia* sp.), which secrete considerable quantities of prussic acid salts in the late fall, and to a less extent Mortonia (*Mortonia scabrella*), sprangletop (*Leptochloa dubia*), and sumac (*Rhus* spp.); infectious abortion in dairy cattle; ulceration of the gizzard in both chicks and growing pullets; and reference to stock poisoning in many parts of the State by the commoner poisonous plants.

Grub in the head; screw-worm control; undulant fever; mastitis control, W. T. OGLESBY (*Louisiana Sta. Circ. 14 (1935), pp. 5*).—Brief practical accounts are given of these affections of livestock.

[Work in animal pathology and bacteriology at the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 11–17, 43*).—Data are reported for the biennium ended June 30, 1934 (E. S. R., 68, p. 811) on control and eradication of Bang's disease, nonspecific abortions, sterility, losses from infections in new-born calves, the pathology of Johne's disease, tissue culture, cellular reaction in the intestinal mucosa to acidfast organisms, involution of the mucosa of the ewe's uterus, bovine fetal pneumonia, bacterial studies of (1) mastitis and (2) *Brucella* infections, cecal coccidiosis in chickens, amebic dysentery, roup, spoilage of dressed ducks, and pullorum disease.

[Work in animal pathology, parasitology, and bacteriology by the Michigan Station] (*Michigan Sta. Rpt. 1934, pp. 179–195*).—Brief reference is made to results obtained in the work of the year (E. S. R., 71, p. 241), including findings in mastitis, by C. S. Bryan; a study of the vaccination of cattle in 44 herds with a nonvirulent living culture of *Brucella abortus*, by I. F. Huddleson, given in tabular form; chlorination of brooder-house floors in the control of coccidiosis, and use of colloidal iodine in treatment of coccidiosis in dogs and silver foxes, pinworms in man, athletic foot, blackhead in turkeys, intestinal worms of poultry, and vaginitis in cattle, both by W. L. Chandler; and pullorum disease of poultry and methods of culturing *Staphylococcus*, both by H. J. Stafseth.

[Work in animal pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 284 (1935), pp. 23, 24–27*).—The activities of the year briefly referred to (E. S. R., 71, p. 526) included breeding and inoculation studies of epidemic tremors in the fowl, the former by A. E. Tepper, F. D. Reed, and T. B. Charles and the latter by C. L. Martin, C. A. Bottorff, and L. W. Slanetz; control of coccidiosis, by Martin, Bottorff, and Charles; poultry autopsies and adult mortality, both by Martin and Bottorff; ruptured egg yolk in domestic fowl, by Martin, Bottorff, and Slanetz; control of and vaccination for infectious laryngotracheitis, by Bottorff and Martin; testing for Bang's abortion disease, by Martin; and pullorum testing, by Bottorff and Martin.

Animal disease investigations [by the Ohio Station] (*Ohio Sta. Bul. 548 (1935), pp. 75–79*).—The work of the year referred to (E. S. R., 71, p. 382) includes that with range paralysis (chicks hatched from eggs of affected flocks, all-mash ration with and without cod-liver oil, and chicks whose parentage was survival birds from an affected flock, by B. H. Edgington, and blood counts, by Edgington and N. Frank); pullorum disease (the influence of flock contact on agglutination titer), by Edgington; nicotinized drinking water as a preventive against ascarid and coccidial invasions of chickens, by [R. M.] Batchelder and R. E. Rebrassier; Bang's disease, by P. Gerlaugh and Edging-

ton; effect on alkalinization of drinking water on the pH of the jugular blood of feeder cattle, by Gerlaugh, C. H. Hunt, and Edgington; field trials with alkalinized drinking water, by Edgington and Martin; bloat in cattle, by A. J. Schalk; swine erysipelas, by Schalk and Edgington; and coccidiosis in lambs, by Rebrassier.

[Report of work with animal parasites by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1934, pp. 20–24, fig. 1*).—In this annual report (E. S. R., 71, p. 382) brief reference is made to the unusual abundance of parasites in cattle, the distribution of helminth parasites, the treatment for parasites in calves, the use of sanitary pens for calves, and the problem of parasite control.

Annual report of the Mysore Serum Institute, Hebbal, Bangalore, for the year 1933–34, S. D. ACHAR (*Mysore Serum Inst. Ann. Rpt., 1934, pp. 2+27*).—The details of control work with diseases of livestock are presented (E. S. R., 71, p. 528).

The myiases of domestic animals in Indochina [trans. title], E. HOUDEMER (*Bul. Soc. Path. Expt., 28 (1935), No. 4, pp. 298–300*).—Particular mention is made of parasitism of the soft tissues of the plantar surface of the feet of equines by *Chrysomyia* (*Pycnosoma*) *bezzianum* Vill.

[Annual administration reports of the Madras Civil Veterinary Department for the years 1931–32, 1932–33, and 1933–34], P. T. SAUNDERS, T. J. HURLEY, ET AL. (*Madras Civil Vet. Dept., Ann. Admin. Rpts., 1931–32, pp. II+35+8; 1932–33, pp. II+42; 1933–34, pp. III+55+2, pls. 2*).—The usual annual reports (E. S. R., 67, p. 450) of the occurrence of and control work with infectious diseases of livestock and the results of investigation and research, particularly of rinderpest, are presented.

Annual report of the Imperial Institute of Veterinary Research, Muktesar, and its sub-station, the Imperial Veterinary Serum Institute, Izatnagar, for the year 1933–34, W. TAYLOR ET AL. (*Imp. Inst. Vet. Res. Muktesar [India], Ann. Rpt., 1934 pp. III+53*).—The research work of the year (E. S. R., 71, p. 528) in the serology section is reported by J. R. Haddow (pp. 15–24), that in the pathology section by S. C. A. Datta (pp. 25–33), and that in the protozoology section by the director, W. Taylor (pp. 34–39). The annual report of the Imperial Veterinary Serum Institute, Izatnagar, is by G. P. Goffi (pp. 40–44).

Report of the veterinary service for the year ending March 1934, J. M. SMITH ET AL. (*Palestine Dept. Agr. and Forests Ann. Rpt., 1934, pp. 43–89*).—The occurrence of and control work with diseases of livestock are included in this report and its appendixes.

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 13 (1934), No. 4, pp. 261–353, pls. 8, figs. 6*).—The contributions presented (E. S. R., 73, p. 383) include the following: On the Filaria from the Formosan Domesticated Birds, by M. Sugimoto (pp. 261–266, Japan. abs. pp. 265, 266); On the Life History of *Plagiorchis* (*Lepoderma*) and *Prosthogonimus* of Dragonflies Found in the Vicinity of Mukden, by S. Ono (pp. 267–280, Eng. abs. pp. 279, 280); Studies of Colic of the Horse—I, A Contribution to the Knowledge of Urinary Colic of the Horse, Particularly the Diagnostic Significance of Glycosuria, by E. Tatezawa (pp. 281–313, Ger. abs. pp. 309–313); On the Rabbit Passage of Rinderpest Virus, by T. Inoue (pp. 314–336, Eng. abs. p. 336); and Antifluorescent Effect of the Growth of Hemolytic Streptococcus on That of Organisms of *Pasteurella* Group, I, by S. Watanabe (pp. 337–353, Eng. abs. pp. 351–353).

[Contributions in animal pathology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 4 (1935), No. 1, pp. 5–90, pls. 2, figs. 16*).—The contributions here presented (E. S. R., 73, p. 238) include the following: Blood Groups of the Horse with Special Reference to Their Significance in Blood Transfusion and

in Horsesickness Immunisation, by P. J. J. Fourie (pp. 7–47); The Occurrence of Cyanogenetic Glucosides in South African Species of *Acacia*, I, by D. G. Steyn and C. Rimington (pp. 51–63); and Isolation of the Toxic Principles of *Cucumis africanus* L. f., *Cucumis myriocarpus* Naud. emend. Schweikerdt, and of *Cucumis leptodermis* Schweikerdt sp. nov., Their Characterisation as Trilactones Belonging to the "Bitter Principle" Class, by C. Rimington (pp. 65–90).

Effect of Fowler's solution on animals, E. Roberts and W. M. Dawson (*Ill. Sta. Bul. 413 (1935), pp. 185–202, figs. 2*).—In experimental work aimed at the determination of the possible effects of feeding Fowler's solution to domestic animals, in which rabbits were employed, the following results were obtained:

"Male rabbits fed Fowler's solution produced a significantly smaller number of young litters from double matings than did untreated males, with a greater percentage of young dead at birth. Treated males on the average were distinctly less active than untreated males at the time of service and produced relatively less semen and fewer sperm per volume of semen. The feeding of Fowler's solution to females increased the mortality of the young and the number of services necessary to produce a litter.

"Fowler's solution fed either to sire or dam had no effect on growth of the progeny. The growth of immature animals was retarded by the use of Fowler's solution. The effect was, however, probably caused indirectly through an increased susceptibility to disease. Observations on living animals, as well as post-mortem examinations, indicated that the use of Fowler's solution was in general detrimental to health. The treated animals were more susceptible to respiratory diseases and pathological conditions of liver and kidney than were untreated animals.

"It would appear logical to conclude from the above results that the feeding of Fowler's solution to farm animals for the purpose of fitting them for showing would detract from their value as breeders because of impairment to fertility and sexual activity and increased mortality among offspring. Both breeding and immature animals would be expected to be more susceptible to disease. Among immature animals the contraction of respiratory and other diseases would tend to interfere with normal growth. Also detrimental effects on internal organs such as kidney and liver would be expected among animals of any age.

"The decreased activity observed among arsenic-fed animals at time of mating is probably indicative of decreased activity at other times. If this is true, such decreased activity is very likely associated with an increase in rate of fat deposition. This may be at least a partial explanation of the general belief that arsenic aids in putting on fat.

"It has been shown that the presence of arsenic can be detected in the urine, feces, and the hair of treated animals. Use could be made of these facts if it is desired to eliminate such animals from competition in shows and to prevent their sale for breeding purposes."

The testing of disinfectants in the presence of organic matter, L. P. Garrod (*Jour. Hyg.* [*London*], *35* (*1935*), *No. 2, pp. 219–237, fig. 1*).—The author finds that "methods of testing disinfectants which introduce feces as added organic matter are subject to error. A method in which a suspension of yeast is used for this purpose causes an equivalent reduction in disinfectant activity, and yields consistent results. Other departures from existing practice are proposed with a view to simplifying the procedure of such a test and improving its accuracy."

Delayed action of selenium poisoning of live stock, O. A. Beath (*Science, 81* (*1935*), *No. 2112, p. 617*).—Accumulative data covering many field and experimental cases indicate that under certain conditions not understood at present

an animal may not show any outward sign of poisoning, perhaps for several months, after grazing upon range plants carrying selenium. When the breakdown occurs, death usually follows in from 1 to 6 days. Animals that survive seldom regain normalcy. Severe cases tend to show much characteristic pathology. It is known that cattle and sheep which appear sound and healthy and suddenly go "off feed", pass bloody urine, and rapidly lose weight may have grazed the causal toxicant months previous to the occurrence of the final acute stage.

A check list of the arthropod parasites of domesticated animals in Queensland, F. H. S. Roberts (*Aust. Vet. Jour., 11 (1935), No. 1, pp. 2–10*).—An annotated list, systematically arranged, is first presented, followed by a domestic host list and a bibliography of 31 references.

The parasites of British birds and mammals.—III, On some parasites living in the nest of the house martin (Chelidon u. urbica Linn.), G. B. Thompson (*Ent. Mo. Mag., 3 ser., 21 (1935), Nos. 242, pp. 46–48; 243, pp. 49, 50*).—A continuation of the accounts previously noted (E. S. R., 72, p. 514).

A new vector in the transmission of hemoparasites of domestic animals, Ornithodorus lahorensis Neumann 1908 [trans. title], A. F. Rastégaieff (*Ann. Inst. Pasteur, 54 (1935), No. 2, pp. 250–258*).—In studies in Leningrad the author found *O. lahorensis* to be capable of transmitting *Anaplasma ovis*. It can also transmit another hemoparasite, identified as *Theileria recondita* or *T. ovis*.

New nomenclature of the Salmonella group [trans. title], C. A. van Dorssen (*Tijdschr. Diergeneesk., 62 (1935), No. 11, pp. 570–576*).—A review is given of the new nomenclature of the *Salmonella* group, as is a discussion of the several well-known serological tests.

Contribution to the study of the virus of Aujeszky's disease [trans. title], P. Remlinger and J. Bailly (*Ann. Inst. Pasteur, 54 (1935), No. 2, pp. 149–184*).—In this second contribution (E. S. R., 72, p. 536) the authors consider the habitat of the virus of Aujeszky's disease (blood, central nervous system), its biological properties, physical nature, and the bacteriological diagnosis of the affection.

Studies of correlated human and bovine brucelliasis: Statistical and serological, R. V. Stone and E. Bogen (*Amer. Jour. Pub. Health, 25 (1935), No. 5, pp. 580–588, fig. 1*).—This contribution is presented with a list of 24 references to the literature.

Brucella infection in butchers, A. Beek (*Brucella-infekties bij slagers. Proefschr., Rijks-Univ., Utrecht, [1935], pp. [10]+96; Ger., Eng., Fr. abs., pp. 86–89*).—In the author's investigations of the occurrence of *Brucella* infection, which included 230 butchers and 35 individuals who had no contact with meat or cattle, 5.5 percent of those occasionally exposed and 14.3 percent of those having a frequent skin exposure were found by administration of the agglutination, complement fixation, and intradermal tests to be infected. A list is given of 168 references to the literature.

Is the mole Talpa europaea susceptible to the virus of foot-and-mouth disease? [trans. title], H. S. Frenkel (*Tijdschr. Diergeneesk., 62 (1935), No. 9, pp. 466–468; Ger., Eng., Fr. abs., p. 468*).—The author concludes that the mole is scarcely susceptible to the foot-and-mouth disease virus and very probably of no importance in the epizootology of this disease.

Investigations on rinderpest immunization, G. N. Hall (*Thesis, Univ. Zürich, [1932?], pp. 158, fig. 1*).—Following a brief introduction and a discussion of the virus of rinderpest, the author deals at length with methods of immunization, the elimination of piroplasms from virulent blood, the serum of immune and hyperimmune animals, immunization with vaccines (pulped organs), and the biology of rinderpest immunization, followed by general remarks on im-

munity against rinderpest. An 8-page list of references to the literature is included.

Tularaemia: Susceptibility of the white-tailed prairie dog, Cynomys leucurus Merriam, G. E. Davis (*Pub. Health Rpts.* [*U. S.*], *50* (*1935*), *No. 22*, *pp. 731, 732*).—In inoculation experiments at the Rocky Mountain Laboratory at Hamilton, Mont., with four adult and three young prairie dogs, all succumbed showing gross lesions suggestive or typical of acute tularemia, and a pure culture of the organism was isolated from the heart blood of one shortly before death. The specific organism was also isolated from a guinea pig injected with lice which had fed on the infected prairie dogs.

Studies in surra.—II, Pseudoreactions in complement-fixation tests for trypanosomiasis, R. Randall (*Philippine Jour. Sci.*, *54* (*1934*), *No. 1*, *pp. 29–42*).—In this second contribution (E. S. R., 71, p. 702), a modification of the complement fixation test for trypanosomiasis is presented which in the Philippine Islands has resulted in the practical elimination of the pseudoreactions formerly obtained.

***The cattle reservoir for equine trypanosomiasis in Panama.*—Additional notes on the subject,** H. C. Clark and J. Benavides (*Amer. Jour. Trop. Med.*, *15* (*1935*), *No. 3*, *pp. 285–299*).—The authors have found (E. S. R., 69, p. 583) that native cattle of the Republic of Panama can act as an important reservoir for *Trypanosoma hippicum*, the cause of equine trypanosomiasis. The survey methods employed indicate that the cattle carrier index will range from 2 to 6 percent where the horse disease is present. Thick blood films will reveal a scant number of trypanosomes from the time of inoculation for about 2 weeks, 6 calves having ranged from 11 to 18 days. The 5 strains of *T. hippicum* recovered from range cattle were injected into healthy horses, an acute trypanosomiasis developing similar in all respects to the strains formerly recovered from horses. "Three vampire bats (*Desmodus rotundus murinus*) were fed on cattle carriers. One acquired the disease and transferred it to a guinea pig. Two failed to acquire the disease. It is quite evident that the peripheral blood of an animal must contain a fair number of the trypanosomes at the time the bat feeds on it."

Relation of allergy to the antibody content in animals vaccinated with B C G, B. J. Clawson and A. B. Baker (*Jour. Infect. Diseases*, *56* (*1935*), *No. 3*, *pp. 297–300*).—In the authors' experiments on animals vaccinated with B. C. G. to study the relation of allergy to the concentration of antibodies in the serum, it was found that there was no definite proportionate or necessary relation between the presence of bacterial allergy as manifested by the intracutaneous tuberculin reaction and antibodies in the blood as indicated by the occurrence of agglutinins and complement fixation antibodies.

Relation of allergy and lesions in animals vaccinated with B C G, B. J. Clawson (*Arch. Path.*, *19* (*1935*), *No. 5*, *pp. 673–678*).—The experiments reported are considered to "support the belief that without a lesion in tuberculous infection there is no allergy, and that an allergic animal is more susceptible to the development of lesions from equal subsequent infections than a nonallergic animal. Allergy did not occur at all in animals in which lesions were not found. An amount of living or heat-killed B. C. G. which failed to produce lesions when injected intravenously into normal animals resulted in the production of extensive lesions in the lungs, livers, and spleens of animals which had previously been made allergic."

Immunization experiments on calves with B C G, A. S. Griffith, J. B. Buxton, and R. E. Glover (*Lancet* [*London*], *1935*, *I*, *No. 8*, *pp. 451–457*).—Following the intravenous vaccination of 21 calves with B. C. G., 2 were resistant after 3 mo.; 4 were resistant and 1 showed slight lesions after 6 mo.; 5

were resistant and 2 showed slight local lesions after 9 mo.; and 1 was resistant, 4 showed local lesions, and in 2 infection was beginning to spread after 12 mo.

It is concluded by the authors that "complete immunity against tuberculous infection by the mouth can be conferred on calves by the intravenous inoculation of B. C. G. The immunity lasts a variable time. . . . Revaccination with 100 mg B. C. G. restored the immunity, but the protection was complete in a smaller proportion of calves than after primary vaccination. When compared with calves receiving a single course of B. C. G. which were tested at the same period after vaccination (6 mo.), the results appear to indicate that revaccination does not give as good an immunity as primary vaccination, but the numbers of calves are too small for definite conclusions on that point."

Rats as a reservoir for the virus of exanthematic typhus fever [trans. title], A. A. KLIMENTOVA (KLIMENTOWA) (*Arkh. Biol. Nauk [Leningrad], Ser. B, 35 (1934), No. 2, pp. 603–611; Fr. abs., pp. 610, 611*).—The author demonstrated through intraperitoneal inoculation of brain tissue that rats trapped in Leningrad were carriers of the virus of exanthematic typhus fever, thus confirming the findings of Mooser and his associates (E. S. R., 66, pp. 460, 850).

A study of the streptococci from fifty cases of bovine mastitis, H. J. GIBSON and R. O. MUIR (*Jour. Hyg. [London], 35 (1935), No. 2, pp. 238–254*).—Fifty-one strains recently isolated from cases of bovine mastitis were studied in their morphological, cultural, and biochemical reactions.

"Using their colony appearance in blood agar as the first differential criterion, we have shown that the strains differ widely from one another and from the α, β, and γ streptococci usually encountered in human disease. The heterogeneity of mastitis streptococci was strikingly demonstrated. From the results of a relatively small number of cultural and biochemical tests it could be shown that no 2 of the 51 strains were identical in every respect. The findings recorded suggest that great caution must be exercised in ascribing a bovine or human origin to individual strains of streptococci on the results of cultural or biochemical reactions."

Pancreas distomatosis [trans. title], H. BUBOORAAY (*Tijdschr. Diergeneesk., 62 (1935), Nos. 8, pp. 399–407, pl. 1; 9, pp. 469–481; Ger., Eng., Fr. abs., pp. 479–481*).—A description is given of the alterations observed in distomatosis of the pancreas of cattle. A report of investigations of the function of the affected pancreas, as determined by the strength of the glandular ferments trypsin and amylase, follows.

Observations on the pathology of blind staggers and alkali disease, J. H. DRAIZE and O. A. BEATH (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 753–763, figs. 12*).—Contributing from the Wyoming Experiment Station, the authors report that the "data from 100 autopsies on cattle and sheep suffering from blind staggers and alkali disease indicate that the toxic principles of both types of injury have very similar physiological actions. The toxicants are acutely toxic to the liver cell. Blind staggers represents a more acute type of poisoning. Atony of smooth muscle is rather severe in blind staggers. Regardless of the irritation of the gastrointestinal tract, there is a stasis of food material, especially in the winter cases. Kidney injury is more severe in alkali disease. Sheep suffer more from this injury than do cattle. Enlarged gall bladders are common in blind staggers and only occasionally observed in alkali disease. The heart is invariably atrophied in severe cases of alkali disease. Injury to the gastrointestinal tract in blind staggers consists of irritation leading to hemorrhage and finally desquamation of epithelium. The injury is of the same character in alkali disease but milder. The hearts and livers of animals suffering from an acute, severe attack of blind staggers

rapidly become permanently injured. An animal so injured exhibits, upon apparent recovery, a roughened, off-color coat and is unthrifty. Many younger animals will appear runty, and due to distended stomachs appear to be bloated chronically.

"Animals given the blind staggers treatment show immediate partial clearing of the eye. Abnormal hoof growths are characteristic of alkali disease only. The erosion of the ends of the long bones is characteristic of both, but is more prevalent in alkali disease. The color and the condition of the coat in poisoned cattle are in a measure diagnostic aids in recognizing this type of injury. Affected sheep have a characteristic stance and appearance; however, this type of intoxication of sheep is not so easily recognized from the behavior and the general outward appearance of the animal. Although it is believed that blind staggers and alkali disease are produced by the same causative agents, nevertheless there is enough difference in the appearance and symptoms exhibited by affected livestock to retain the two terms. On the other hand, the microscopic pathology hardly justifies the designation of blind staggers and alkali disease as representing two different types of intoxication."

The anaplasmosis of sheep in Nièvre [trans. title], H. CARRÉ and AVIGNON (*Rev. Gén. Méd. Vét., 44 (1935), No. 519, pp. 129–138, figs. 6*).—A report of the occurrence of anaplasmosis in a flock of sheep in Nièvre.

Entero-toxaemia in sheep of Palestine, D. MOSSINSON (*Vet. Jour., 91 (1935), No. 5, pp. 215–218*).—A brief review is given of information on the affection known as enterotoxemia or pulpy kidney disease and due to *Bacillus welchii* or *B. ovitoxicus*, which was discovered in 1934 by the Government Veterinary Pathologist in the laboratory at Jaffa, Jerusalem.

Epizoötic tick-borne tularemia in sheep in Montana, C. B. PHILIP, W. L. JELLISON, and H. F. WILKINS (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 726–744, figs. 3*)—In an explosive outbreak of disease among sheep near Ringling, Mont., in April and May 1934, approximately 40 percent of 1,320 yearling ewes were symptomatically affected and 200 died before the epizootic subsided. "Observations made locally showed (1) unusually heavy infestation of the sheep by wood ticks (*Dermacentor andersoni*), (2) appearance of illness following removal from winter to summer range with estimated incubation period of 8 to 10 days, (3) coincident mortality among tick-infested jack rabbits, (4) subsidence of the epizootic with reduction in the local tick population (although aided by mechanical control of ticks as far as the sheep were concerned), and (5) occurrence of a human case of tick-transmitted tularemia. Tularemia infection was largely responsible for the epizootic as indicated by the following laboratory data: (1) Recovery of *Bact[erium] tularense* from tissues of 5 of 6 affected sheep and from 2 of 18 dead or killed whitetail jack rabbits, (2) recovery of that organism from 12 of 19 samples of ticks off infected sheep and from 6 of 24 samples of ticks off dead or killed jack rabbits, and (3) positive agglutination tests with 26 sheep sera of 32 apparently affected animals in titers roughly corresponding to the stage of illness or of recovery. Only 1 of 4 sera from apparently normal sheep showed agglutinins and then in low titer. Histopathological study of tissues of 2 of 3 affected sheep and of 1 rabbit confirmed the positive test data on these animals."

It is pointed out that "in view of the amount of tularemia infection in ticks and animals shown to be present, two observations are particularly puzzling: (1) The failure to recover *B. tularense* from unfed ticks collected locally, and (2) the failure of the owners, employees, or investigators to become infected in spite of massive exposure to infected carcasses, ticks, and tick-feces-contaminated wool."

Worms in sheep: Different types and their control, H. O. Mönnig (*Farming in So. Africa, 10 (1935), No. 109, pp. 175–182, figs. 17*).—A practical illustrated summary of information.

Tapeworm studies.—I, Restricted pasture sources of Moniezia infection in sheep, N. R. Stoll (*Amer. Jour. Hyg., 21 (1935), No. 3, pp. 628–646, fig. 1*).—This contribution deals with the occurrence of *M. expansa* infection in relation to several fields, all within a short distance of each other, on the laboratory farm of the Rockefeller Institute for Medical Research near Princeton, N. J. The demonstrated failure of this tapeworm to spread from infested to uninfested areas except within infected sheep is considered to support the conception not of an intermediate host but of direct infection from contaminated soil or forage. A list is given of 17 references to the literature.

The toxicity for sheep of water solutions of hydrocyanic acid and the effectiveness of the nitrite-thiosulphate combination as a remedy, J. F. Couch, A. B. Clawson, and H. Bunyea (*Jour. Wash. Acad. Sci., 25 (1935), No. 6, pp. 272–276*).—In further work (E. S. R., 73, p. 242), the authors report that when administered to sheep as a drench "the minimum toxic dose of pure hydrocyanic acid is shown to be approximately 1.05 mg per kilogram of animal weight, and the minimum lethal dose is approximately 2.29 mg per kilogram. When compared on a cyanide (CN) basis, the differences in toxicity between hydrocyanic acid and potassium cyanide are slight and well within the limits of experimental error. Following the administration of pure hydrocyanic acid, symptoms appear in an average of 50 sec. The time to collapse is very variable. In the cases here reported the average time was 5 min. 52 sec. When no remedy was given the average time to death was nearly 38 min. The nitrite-thiosulfate combination was 50 percent effective as a remedy against from 3 to 4 m. l. d., and when injected intraperitoneally within 4 min. after the hydrocyanic acid was administered."

Bang's disease in bison and elk in the Yellowstone National Park and on the National Bison Range, E. A. Tunnicliff and H. Marsh (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 745–752, figs. 2*).—Three years (1931–33) of testing by the Montana Experiment Station of the Yellowstone herd of buffalo have shown "72 percent of 76 bulls, 44 percent of 63 steers, and 66 percent of 301 cows as reactors to the test. The records of the slaughtered buffalo from the National Bison Range for 2 yr. show 66 percent of 90 bulls and 54 percent of 74 cows as reactors. . . .

"The possibility was suggested that elk grazing over the buffalo range may have picked up the infection. This point was borne out by blood tests conducted on 105 elk serums in 1931 and 1932. Of this number, 8 percent reacted positively and 14 percent gave suspicious reactions in a 1:25 dilution. These reactions would indicate some of the elk on this range had at least become sensitized to the Bang infection. There has been very little mingling of these elk from the buffalo range with a small herd some 30 miles distant, in the vicinity of Mammoth. Blood tests of the latter herd should give some idea of the normal agglutinins carried by elk for *Br[ucella] abortus*. During 1931 and 1932, 45 of these elk serums were tested. No positive reactions were found, but 2 (4 percent) gave suspicious reactions at 1:25. These figures would confirm the suspicion that elk may become sensitized to *B. abortus*, and the higher number of reactors among elk running on the buffalo range indicates the buffalo as the source of infection."

Results of inoculating laboratory animals with equine brain-tissue suspensions and equine brain-tissue filtrates from spontaneous cases of so-called cornstalk disease, R. Graham (*Jour. Amer. Vet. Med. Assoc., 86 (1935),*

No. 6, pp. 778–780).—The results obtained in the inoculation of laboratory animals with brain tissue suspensions and brain tissue filtrates from horses dead of so-called "cornstalk disease" are considered to support the contention that the type of equine encephalomyelitis which occurred in Illinois in 1934–35 probably is not associated with either the eastern or the western virus of equine encephalomyelitis.

Equine encephalomyelitis studies.—I, Cross-immunity tests between eastern and western types of virus, M. S. SHAHAN and L. T. GILTNER (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 764–772*).—In continuation of their earlier work (E. S. R., 71, p. 538), evidence of the existence of two immunologically different types of equine encephalomyelitis virus is reviewed by the authors, and cross-immunity tests in horses tending to confirm previously reported observations in guinea pigs that eastern and western viruses are of two distinct types are reported.

"Three western-virus-immune horses exposed intracerebrally to eastern virus developed typical encephalomyelitis and were destroyed in extremis. With 1 exception, 18 eastern immunes inoculated intracerebrally with western virus developed typical encephalomyelitis, and of these 9 were sacrificed when in a hopeless condition, while 8 which did not become prostrate were allowed to continue in the experiment, 3 making incomplete recoveries and 5 partial or delayed recoveries.

"A calf immune to western virus manifested a typical encephalomyelitis syndrome following intracerebral exposure to eastern virus. A sheep which had resisted two intracerebral inoculations of western virus without any noticeable reaction developed typical encephalomyelitis and died.

"That occult cases of encephalomyelitis may occur amongst experiment animals is illustrated by the case in which a horse, exposed to bites of western-virus-infected mosquitoes, developed only a mild indisposition without a true febrile reaction, but was shown to carry virus in its blood intermittently for at least 72 hr.

"The designation of the two apparent types of encephalomyelitis virus as 'eastern' and 'western' may be objectionable, but the use of the terms is suggested as advisable, at least in the United States, until such time as further studies may reveal more specific differential characteristics."

Equine encephalomyelitis cross-immunity in horses between western and eastern strains of virus.—Supplemental report, E. RECORDS and L. R. VAWTER (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 773–777*).—The authors have conducted (E. S. R., 71, p. 702) cross-immunity tests at the Nevada Experiment Station on "11 horses which were presumably immune to western virus either as a result of deliberate immunization or survivors to the experimentally induced disease. Eight of these 11 horses were also resistant to the eastern type (Delaware and New Jersey) of encephalomyelitis."

The failure of 1 horse "to survive the immunity test with New Jersey virus raises the question as to whether or not the symptoms shown were positively due to virus infection. However, 2 other horses which were known to be resistant to western virus failed to survive when subsequently exposed to eastern virus. [A horse] which recovered from a severe attack of encephalomyelitis induced by intranasal instillation of Delaware virus was subsequently resistant to intracranial injection of virulent western virus.

"Serum-protection and cross-immunity tests conducted with guinea pigs alone would imply that the eastern and western strains of equine encephalomyelitis virus could be placed in separate immunologic groups. . . .

"It now appears, from cross-immunity tests on horses, using both established stock strains and recently recovered strains with limited foreign-host

passage, that the differences between the western and eastern types of virus may be only different degrees of virulence rather than specific immunologic dissimilarity. The virus of equine encephalomyelitis apparently not only may enter the equine host through the nasal mucosa but may also be discharged from this region while the virus is present in the blood."

Protective vaccination of horses with modified equine encephalomyelitis virus, E. Traub and C. Ten Broeck (*Science, 81 (1935), No. 2110, p. 572*).—The authors report that by serial passage through pigeons a strain of equine encephalomyelitis virus of the eastern type has been so changed that it promises to be of value as a vaccine. The pigeons were inoculated by the intracerebral route, under ether anesthesia, and the brain tissue for passage secured from those that had just died or were killed when moribund. The virus has been carried through 100 passages, but most of the work here reported was conducted with brains from the fortieth and forty-ninth serial passages.

In order to secure a larger amount of material, a young lamb was inoculated intracerebrally with brain from the fortieth pigeon passage and another lamb similarly inoculated with brain from the forty-ninth pigeon passage, both lambs promptly developing the disease and dying. The brains of these lambs were preserved in sterile 50 percent glycerin and suspensions made as needed for the experiments. It was found that "as little as 1 cc of a 10^{-3} dilution of a 10 percent suspension of the brain of either lamb injected subcutaneously into guinea pigs would immunize against from 10,000 to 100,000 infective doses of the unmodified virus injected either subcutaneously or intracerebrally. Of 117 guinea pigs inoculated with the 10 percent brain suspension, 8, or 7 percent, died with symptoms of encephalitis and all but 15 of the remainder were immune. . . .

"Under controlled laboratory conditions 11 horses have been inoculated subcutaneously with suspensions of the lamb brains mentioned above. The majority of the animals were given 10 cc of a 10 percent suspension. Not 1 horse developed a temperature nor could virus be demonstrated in blood drawn at various intervals after the injection. . . . Sixty-seven horses were each given subcutaneous injections of 5 cc of the 10 percent lamb brain suspension. The inoculations were made in a region where there were many cases of encephalomyelitis, and 2 of the inoculated animals developed the disease. The virus present in the 1 brain secured was highly virulent for guinea pigs and was evidently not the strain injected. The other 65 horses showed no reaction to the virus, except that many of those tested, as well as all those inoculated at the laboratory, developed neutralizing antibodies.

"Testing the immunity of horses is a difficult problem, because the only certain method of producing disease in these animals is by the intracerebral injection of virus and only a horse with a very high degree of immunity can withstand such an inoculation. Four out of 9 vaccinated animals tested by this method showed no temperature reaction or other sign of infection. The other 5 animals, after an incubation period that was from 1 to 2 days longer than that in the controls, developed the disease and died. Two other vaccinated horses inoculated intravenously with virus showed no evidence of disease, but since only 1 of 2 controls was infected the results are not conclusive.

"In spite of the fact that more than half of our vaccinated horses died from a test intracerebral inoculation, we believe that vaccination with the modified virus will protect against the natural disease."

Experimental brucellosis in dogs, W. H. Feldman, J. L. Bollman, and C. Olson, Jr. (*Jour. Infect. Diseases, 56 (1935), No. 3, pp. 321–332, figs. 2*).—In these experiments two strains of *Brucella abortus* obtained from swine and

bovine sources, respectively, were administered intravenously and fed to fasting dogs. *Brucella* agglutinins were produced by both strains. It was shown that a profound resistance to the organism exists which precludes, in most instances, the development of clinical symptoms and specific lesions.

Ten years' progress in knowledge of poultry diseases, F. R. BEAUDETTE (*New England Poultryman and Northeast. Breeder, 20 (1935), No. 4, pp. 35, 36, 89*).—This contribution from the New Jersey Experiment Stations briefly summarizes the advances made in the knowledge of ultravisible virus, bacterial, protozoan, parasitic, and nutritional affections of poultry in the last decade.

Peroral vaccination against fowl diseases [trans. title], [G.] LISSOT (*Rev. Path. Compar., 34 (1934), No. 458, pp. 1643–1654; abs. in Vet. Bul., 5 (1935), No. 6, pp. 363, 364*).—A digest of, with 24 references to the literature on, peroral vaccination against diseases of the fowl is presented with the results obtained in work with fowl cholera, fowl typhoid, and pullorum disease. Peroral vaccination was very successful in two flocks of chickens in which outbreaks of *Salmonella pullorum* infection had occurred.

The transmission of fowl leukosis with desiccated blood, E. L. STUBBS (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 721–725, fig. 1*).—In the work reported, "blood from a chicken with typical erythroleucosis (strain 1) was dried from the frozen state in vacuo over phosphorus pentoxide. The desiccated blood was kept in sealed test tubes in the refrigerator and tested at various times for longevity of the causative agent. Tests were made 2, 89, 283, 365, 442, and 932 days after desiccation. Chickens came down with leucosis in all groups except one. These experiments indicate that the causative agent of transmissible leucosis of chickens (strain 1) retains its activity in the dry state for as long as 932 days."

Attempts to transmit chicken leukosis by mosquitoes and by mites, H. L. RATCLIFFE and E. L. STUBBS (*Jour. Infect. Diseases, 56 (1935), No. 3, pp. 301–304*).—The studies reported have shown that the virus of fowl leukemia will survive for at least 3 hr. in the stomach of the house mosquito (*Culex pipiens*) and the yellow fever mosquito. "All attempts at mechanical transfer of the virus by alternate interrupted feedings, first on leukemic and then on healthy fowls, by these species of mosquitoes were negative. There was no evidence that the virus of fowl leukemia undergoes part of its life cycle in these mosquitoes. Attempts to produce transmission of leucosis by mites [the chicken mite] in a suitable environment, permitting the mites to feed on leucotic chickens and normal chickens were negative. The virus of transmissible chicken leucosis became inactivated within 24 hr. in mosquitoes and mites."

Pullorum disease, J. BIELY, E. A. LLOYD, and W. ROACH (*Victoria: Brit. Columbia Dept. Agr., 1933, pp. [3]+30*).—A practical summary, in mimeographed form, of the present status of knowledge of pullorum disease and means for its control. A summary of the recorded occurrence of pullorum infection in several Provinces of Canada, namely, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, is given in an accompanying table.

Experiments on the toxicity to fowls of arsenite of soda and poisoned locusts, J. K. CHORLEY and R. MCCHLERY (*Rhodesia Agr. Jour., 32 (1935), No. 5, pp. 322–326*).—The tests reported show that when arsenic is administered in small quantities, such as occurs in sprayed grasshoppers, a domestic fowl can tolerate comparatively large doses over a long period without any visible ill effects. Grasshoppers sprayed at normal strength can be fed to poultry without any danger, as it appears to be impossible for them to consume sufficient numbers of the grasshoppers in 1 day to obtain a lethal dose of arsenic.

The agglutination test in salmonellosis in the duck [trans. title], J. JANSEN (*Tijdschr. Diergeneesk., 62 (1935), No. 10, pp. 517–526; Ger., Eng., Fr. abs., pp. 525, 526*).—In the application of the agglutination test to 29 ducks for salmonellosis, in which as an antigen both *Salmonella enteritidis* (duck) and *S. typhimurium* were employed, the rapid serum and the tube tests yielded the same results, 10 birds reacting positively and 19 negatively to *S. enteritidis*. Of the 10 birds, 6 also reacted to the rapid blood test, 2 were weakly positive, and 2 were negative. With the rapid blood test only a weak reaction occurred when the blood contained few agglutinins. It appears that nonreacting birds may suffer from oophoritis while in positive-reacting birds the ovaries may be normal. In 5 cases *S. enteritidis* was isolated from the ovaries and once from an inflamed joint. The strains fermented dulcite slowly.

Blood parasites of ruffed grouse (Bonasa umbellus) and spruce grouse (Canachites canadensis), with description of Leucocytozoon bonasae n. sp., C. H. D. CLARKE (*Canad. Jour. Res., 12 (1935), No. 5, pp. 646–650, pl. 1, fig. 1*).—A list is given of the blood parasites found in ruffed and spruce grouse in Ontario, which include *L. bonasae* n. sp., *Trypanosoma gallinarum* Bruce et al. 1911, and microfilariae. Members of the genus *Leucocytozoon* being known to be pathogenic, the possibility of a connection between *L. bonasae* and the problem of grouse periodicity is suggested.

Aspergillosis of wild turkeys reared in captivity, A. J. DURANT and C. M. TUCKER (*Jour. Amer. Vet. Med. Assoc., 86 (1935), No. 6, pp. 781–784, figs. 3*).—The authors' studies in Missouri indicate that *Aspergillus fumigatus* Fres. from infected feed was responsible for the epizootic among wild turkey poults. The commercial feed contained cod-liver oil and fishmeal, and under damp conditions proved a good medium for the development of *A. fumigatus*.

Paratyphoid in the silver fox [trans. title], L. DE BLIECK and J. JANSEN (*Tijdschr. Diergeneesk., 62 (1935), No. 9, pp. 457–464; Ger., Eng., Fr. abs., pp. 463, 464*).—A review of the literature, a list of 16 references to which is presented, and personal investigations are said to have shown that paratyphoid in silver foxes may be caused by *Salmonella typhimurium* (Aertrycke, Breslau), *S. cholerae suis* var. *kunzendorf* (*suipestifer* Kunzendorf), *S. enteritidis* var. *danysz* (Gärtner-Danysz, Ratin), and *S. enteritidis* var. *dublin* (Gärtner-Kiel). It is thought that by thorough examination of each case it may be possible to find still other varieties.

In the Netherlands all cases examined by the authors were found to be due to *S. enteritidis* var. *dublin*. They treated the animals with 0.2 percent of formol (broth) vaccine, injecting this vaccine into 275 foxes subcutaneously in a dose of 1 cc, followed at an interval of a week by a second injection of 2 cc. Two animals which were already affected died; all other animals remained healthy.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations at the Arizona Station] (*Arizona Sta. Rpt. 1934, pp. 22–27*).—The progress results are briefly presented of investigations on fluorine in drinking water, rehabilitation of defaulting irrigation districts, rural housing, ground water, and pumping machinery.

[Agricultural engineering investigations at the Michigan Station] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 6, 7*).—The progress results are briefly presented of investigations on tractors, the application of electric energy to farm use, asphalt concrete, irrigation, whitewashes and asphalt paints, and threshing machinery for small experimental lots.

[Agricultural engineering investigations by the Michigan Station], H. H. MUSSELMAN and W. L. MALLMANN (*Michigan Sta. Rpt. 1934, pp. 174, 175, 198–*

200).—Progress results are presented briefly of experiments on porous hose irrigation, the use of low pressure rubber tires on tractors, and water supplies.

[Agricultural engineering studies by the New Hampshire Station] (*New Hampshire Sta. Bul. 284* (*1935*), *pp. 17, 28, 29*).—Results are briefly noted of the effectiveness of creosoting white pine fence posts, by K. W. Woodward; tests of pneumatic tractor tires, by W. T. Ackerman and G. M. Foulkrod; electric brooding of chicks, by Ackerman, T. B. Charles, Foulkrod, A. E. Tepper, and F. D. Reed; and rural housing, in cooperation with the Civil Works Administration.

[Agricultural engineering investigations by the Ohio Station], C. O. Reed, R. M. Salter, R. C. Miller, C. W. Gay, G. W. McCuen, E. A. Silver, and V. L. Overholt (*Ohio Sta. Bul. 548* (*1935*), *pp. 89–95, figs. 2*).—The progress results are briefly presented of studies on fertilizer application with corn planters, trench silos, threshing machines, wear of metals in agricultural machinery, wheel equipment for farm machinery, irrigation, and farm housing.

Surface water supply of the United States, 1933, Parts 4, 7, 9, 11, 12 B (*U. S. Geol. Survey, Water-Supply Papers 744* (*1935*), *pp. V+159, fig. 1; 747* (*1935*), *pp. V+121, fig. 1; 749* (*1935*), *pp. V+119, fig. 1; 751* (*1935*), *pp. XI+376, fig. 1; 753* (*1935*), *pp. VII+197, fig. 1*).—Of the papers which here present the results of measurements of flow made on streams during the year ended September 30, 1933, No. 744 covers the St. Lawrence River Basin; No. 747, the lower Mississippi River Basin; No. 749, the Colorado River Basin; No. 751, the Pacific slope basins in California; and No. 753, the North Pacific slope basins—Snake River Basin.

Daily river stages at river gage stations on the principal rivers of the United States, compiled by M. W. Hayes (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 31* (*1933*), *pp. III+167*).—This volume, containing the daily river stages for 1933, is the thirty-first of a series (E. S. R., 70, p. 838).

Bibliography on flood control, compiled by D. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, pp. 9*).—This mimeographed bibliography contains over 100 references to literature on the subject.

Drainage and irrigation, soil, economic, and social conditions, Delta Area, Utah.—Div. 1, Drainage and irrigation conditions, O. W. Israelsen (*Utah Sta. Bul. 255* (*1935*), *pp. 70, figs. 8*).—It is the purpose of this bulletin to present the results of parts of a detailed cooperative study of some of the factors which have contributed to the financial difficulties on certain projects on the Delta Area, Utah. A large amount of data is presented, and conclusions mainly of local significance are drawn.

Measuring water for irrigation, J. E. Christiansen (*California Sta. Bul. 588* (*1935*), *pp. 96, figs. 38*).—The chief purpose of this bulletin is to describe the more common methods and devices used for measuring irrigation water in California. Although prepared primarily for use by farmers, ditch tenders, and county agents, it includes also an explanation of some principles of water measurement and a discussion of some methods for the benefit of engineers. The more practical aspects of water measurement, together with tables for use with important devices, are presented in the first part. Explanations of theory and discussions of technical methods appear in the second part. The water measurement devices and methods dealt with include stream measurement by velocity-area methods, weirs, orifices, Parshall measuring flume, and commercial irrigation meters.

Soil erosion and its prevention, compiled by D. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1935, rev., pp. 91*).—This is a partial mimeographed list of references on the subject from 1900 to 1934.

Soil erosion in Missouri, L. D. Baver (*Missouri Sta. Bul. 349 (1935), pp. 66, figs. 23*).—It is the purpose of this report to (1) present the picture of the seriousness of erosion in the various soil areas of the State as it now exists, (2) call attention to the factors that have contributed to soil losses by erosion, and (3) suggest possible means of controlling erosion most effectively throughout the various sections of the State in accordance with the properties of the soils.

Erosion and terracing (*Puerto Rico Sta. Rpt. 1934, p. 20*).—Progress results of experiments on the protection of terrace banks against erosion by planting with *Cordyline guineensis* are briefly presented.

Public Roads, [April, May, and June 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), Nos. 2, pp. 17–34+[4], figs. 13; 3, pp. 37–55+[1], figs. 14; 4, pp. 57–76+[2], figs. 20*).—These numbers of this periodical contain the status of U. S. Public Works road construction as of March 31, April 30, and May 31, 1935, respectively, together with the following articles:

No. 2.—Some Characteristics of Traffic on New Jersey Highways, by L. E. Peabody (pp. 17–31); Needed Research on Flexible-Type Bituminous Roads, by E. F. Kelley (pp. 32, 33); and Roadside Planting Survives Drought, by J. M. Hall (p. 34).

No. 3.—A Study of the Weights and Dimensions of Trucks, by J. T. Thompson (pp. 37–52).

No. 4.—Subsurface Exploration by Earth Restivity and Seismic Methods, by E. R. Shepard (pp. 57–67, 74); and Extracts from Report on Florida Traffic Survey, by L. E. Peabody (pp. 68–74).

Gasoline and motor oil inspection (*Maine Sta. Bul. 377 (1934), p. 413*).—Data are presented from analyses of 164 samples of gasoline and 139 samples of motor oil.

Artificial curing of forage crops, H. T. Barr (*Louisiana Sta. Bul. 261 (1935), pp. 14, figs. 4*).—The results of 5 yr. of investigations on artificial curing of hay are summarized. These indicate that artificial drying of hay crops is an economical and practical operation in the humid area.

By artificial curing, a hay may be produced which is uniform as to color, odor, and food value, regardless of weather conditions. Feeding trials with beef cattle gave faster gains on machine-dried soybean hay as compared with chopped field-cured soybean hay, and have shown 2,000 lb. of artificially cured hay to be equivalent to 3,237 lb. of long field-cured soybean hay for beef cattle. Dairy cattle gave favorable results on artificially cured hays for each of the 3 years' tests.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Maine Station, 1934] (*Maine Sta. Bul. 377 (1934), pp. 323–326, 327–334, 360–367, fig. 1*).—Findings not previously noted are reported as to (1) farm capital, receipts, expenses, profits, acreages, and crops, tractive power, the factors affecting labor income, etc., on 38 farms in 1929 and 1930, in a study of the organization and management of potato farms in central Maine, by W. E. Schrumpf; (2) the costs and returns on the above 38 farms and on 120 potato farms in the Presque Isle area and 45 farms in the Houlton area of Aroostook County in 1928, 1929, and 1930, in a study of costs and returns in producing potatoes in Maine, by Schrumpf; and (3) the effect of the depression on the income from Maine dairy farms, the factors responsible for decreased income, the adjustments made by dairymen, and the extent to which Maine and other New England dairymen have controlled milk production, as shown by 178 records for 1928 covering the State and 255 records for the year ended April 30, 1933, secured in the vicinities of

Unity, Brooks, Belfast, and Union in 1933, and 291 records secured during the summer of 1934 in the vicinities of Farmington and Portland, in an economic study of the dairy industry in Maine, by G. F. Dow.

[Investigations in farm management by the Michigan Station, 1933–34] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 36–38*).—Brief results not previously noted are given for studies of beef feeding costs and returns in 1933–34 of 12 feeders with 568 head of cattle, tractor costs of 78 farmers in 1933, and the average operator's labor and management wages in 1933 of farmers on 137 farms in central Michigan grouped by acreage.

[Investigations in agricultural economics by the New Hampshire Station, 1933–34] (*New Hampshire Sta. Bul. 284 (1935), pp. 5–9, 29*).—Brief statements are included as to findings in the following investigations: Efficiency studies in dairy farming, by H. C. Woodworth, C. W. Harris, S. Colby, and A. Hangas; dairy herd replacements in southern New Hampshire, by H. C. Grinnell; land utilization in Grafton County, by Woodworth; study of delinquent taxes, tax sales, and transfers (in cooperation with the Civil Works Administration), by Grinnell; spray management studies, by E. S. Rasmussen, Woodworth, and G. F. Potter; egg auction sales, by L. A. Dougherty; and part-time farming study (in cooperation with the Civil Works Administration).

[Investigations in agricultural economics by the Ohio Station, 1933–34] (*Ohio Sta. Bul. 548 (1935), pp. 84–88*).—Brief statements regarding investigations include (1) some findings by F. L. Morison in a study of 202 part-time farm families in the vicinity of Columbus, Ohio; (2) a table by H. R. Moore showing the percentages of the rural land area in northwestern, northeastern, southeastern, and southwestern Ohio which was tax delinquent each year from 1928 to 1932; (3) a table by G. F. Henning and P. Eckert showing the dates of organization of 57 private and cooperative auction sales; (4) a table by R. W. Sherman showing the sales and disposal of milk as reported by producers, 1930 and 1933, in the Columbus, Canton, Dayton, and Cincinnati market areas; (5) some findings regarding the costs of marketing fruits and vegetables on the Columbus wholesale produce market by C. W. Hauck; and (6) some findings in a study of quality and price relationships of canned fruits and vegetables by Hauck.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 173 (1935), pp. 99, 100*).—In an article entitled Ohio's Farm Income in 1934, a table by F. L. Morison shows the estimated gross cash income from sales of meat animals, dairy products, grains, poultry and eggs, potatoes, wool, and all other products from Ohio farms, by years 1930–34, and the average for the period 1910–14. A table by J. I. Falconer of index numbers of production, prices, and income (E. S. R., 72, p. 861) is brought down through January 1935.

Organization of farms in southeastern Michigan, P. G. Minneman and E. B. Hill (*Michigan Sta. Spec. Bul. 254 (1934), pp. 51, figs. 17*).—This bulletin, which is a companion publication to that previously noted (E. S. R., 70, p. 697), reports work carried on in cooperation with the U. S. D. A. Bureau of Agricultural Economics which "shows the organization of some of the more successful farms in southeastern Michigan and the changes that may be made to adjust the individual farm business to the changed economic conditions.

"This discussion is concerned with 'what' and 'how much' to produce rather than with 'how' to conduct the various farm operations. The problems are primarily to determine the most desirable combination of enterprises and to plan the entire farm business. Due to the fact that the European corn borer has been present longer in this area than in any other area in the Central States, it is desirable to determine the extent to which the organization of

farms in this area is being adjusted to corn borer conditions and the extent to which further changes may be necessary in case of severe damage." It is based upon the analysis of financial and feed records kept by cooperating farmers and additional data on crop and livestock practices and requirements obtained by visits to the farms.

Records were completed by 121 farmers in 1930, 105 in 1931, and 63 in 1932. The factors affecting farm organization in the area are discussed briefly, and a table is included showing a summary of the organization, the 3-yr. average volume of business, and the income of the several types of farms studied. The investments; indebtedness; receipts; expenditures; net financial returns; variations in size and intensity of organization; crop, livestock, and labor, power, and equipment organization of the farms; and different types of farms are analyzed and discussed. Farm organization is discussed under conditions of light and severe European corn borer damage. Comparisons are made of the organization and financial returns from well organized and poorly organized farms.

Economic changes in Montana's wheat area, E. A. STARCH (*Montana Sta. Bul. 295 (1935), pp. 70, figs. 26*).—This work was in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Part 1 describes and discusses the changes from 1920 to 1930 in livestock population, distribution of crop area, land and machinery investments, number of horses for power, number of farms, acreage per farm, etc., in the Montana wheat area—16 northeastern and north central counties.

Part 2 analyzes and discusses on the basis of 100 leading farms on which complete mechanization had taken place, the changes in landownership, tilled acreages, amount of livestock, farming technic, farm power, investment in equipment, operating reserve, etc. The data for these farms were obtained in studies made of them in 1928–29 and 1930–31.

Part 3 discusses the variations in distribution of tilled acreage, power, and implement units in the five districts of the area, and makes an analysis for a few individual farms.

The public range and the livestock industry of Nevada, C. A. BRENNEN, C. E. FLEMING, G. H. SMITH, JR., and M. R. BRUCE (*Nevada Sta. Bul. 139 (1935), pp. 19, figs. 3*).—"The purpose of this bulletin is to call attention to some of the salient points in connection with the use of the public range in order to assist in stabilizing the livestock industry in Nevada." The history of the range livestock industry in the State, ranch earning power, the importance of range to earning power, and range use and the present situation are described and discussed.

1934 pullet and broiler production costs on 100 Michigan farms, K. T. WRIGHT and P. F. AYLESWORTH (*Michigan Sta., 1934, M-126, pp. [1]+17, figs. 2; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 136–141, fig. 1*).—Data gathered in a study of flocks on 100 farms are analyzed. Tables are included showing, by item groups, the costs, credits, etc., per farm, per pound of poultry, and per pullet for the 100 farms and the 20 high- and the 20 low-cost farms. The effects on costs and returns of breed, number of chicks, hatching date, price of chicks, feed per pound of poultry, labor requirements, mortality, floor space, age at which broilers were sold, income from broilers, value of pullets, efficiency of management, etc., are discussed. Comparisons are made of pullet production costs and returns with those obtained in similar studies in 1931, 1932, and 1933.

The flocks were graded by giving a point if above average in the following efficiency factors: (1) Chicks hatched before May 1, (2) less than 12.6 mortality, (3) less than 27 hr. labor per 100 chicks, (4) less than 4.7 lb. of feed per pound

of poultry, (5) less than 17.4 ct. of total cost per pound of poultry, (6) more than $13.02 broiler income per 100 chicks, and (7) more than 82 ct. value per pullet. The average cost per pound of poultry produced and net cost per pullet were as follows for those receiving different number of points: Zero and 1 point, 20.8 and 75 ct.; 2 points, 20.7 and 71 ct.; 3, 19.5 and 64 ct.; 4, 16.8 and 51 ct.; 5, 15.2 and 50 ct.; and 6 and 7 points, 15 and 46 ct.

Laying flock costs and returns in Michigan, 1934, K. T. WRIGHT and P. F. AYLESWORTH (*Michigan Sta., 1934, M–127, pp. [1]+17, figs. 4; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 130–135*).—The data gathered in a study of 90 flocks are analyzed. Tables are included showing the charges and credits, by item groups, per hen and per dozen eggs for all flocks and for the 18 low-cost and 18 high-cost flocks. The factors on costs and returns of egg production per hen, fall egg production, use of lights, feeding efficiency, size of flock, breed of poultry, pullets v. old hens, and selling price of eggs are analyzed and discussed. Comparison is made with the egg production costs and returns found in similar studies in 1932 and 1933. The combined costs and returns from all poultry on 51 of the farms and on the 10 low-profit and 10 high-profit farms of the 51 farms are also shown by item groups.

Each cooperator was given a point toward his final grade whenever better than average in the following points: (1) At least 55 eggs per hen, (2) 24.2 eggs per hen during October, November, and December, (3) not over 6.1 lb. of feed per dozen eggs, (4) a labor charge of not over 2.5 ct. per dozen eggs, (5) a depreciation charge of not over 3 ct. per dozen eggs, (6) an average sale price of at least 18.6 ct. per dozen for the year, and (7) death loss not over 20.8 ct. The following average net profit per hen and cost per dozen eggs were shown for those receiving different numbers of points: None or 1 point, −47 and 22.6 ct.; 2 points, −25 and 21 ct.; 3, −4 and 19.7 ct.; 4, 17 and 18.8 ct.; 5, 29 and 17.2 ct.; 6, 78 and 13 ct.; and 7 points, 87 and 14 ct.

Production of crops and livestock on the Newlands project in 1934, F. B. HEADLEY (*Nevada Sta. Bul. 138 (1935), pp. 9, fig. 1*).—This bulletin continues the series of statistical reports previously noted (E. S. R., 71, p. 409).

A study of the costs and returns from grading vegetables, R. B. CORBETT (*Rhode Island Sta. Bul. 249 (1935), pp. 47, figs. 13*).—This study, carried on in 1930 and 1931, was made to determine the costs and returns from exact grading as compared with those from individual farmers' pack. The grading, packing, and labeling were done on the farm under the usual farm conditions and the products were sold through ordinary competitive channels. Every effort was made to keep all factors constant in the highly graded and ordinarily graded lots except grading, sizing, and labeling. Hothouse tomatoes, field tomatoes, bunched beets, bunched carrots, cucumbers, and peppers were included. The time requirements, costs, returns, etc., for each vegetable under each system are analyzed and compared. Some points raised in connection with superior grading are discussed.

Superior grading in some instances yielded a return above costs but in general was not profitable. The chances for profit seemed less with low-priced products such as bunched beets and carrots than with products such as tomatoes and peppers. Profits from rigid grading were related to the percentage of the crop which met the grade requirements. The premium paid for highly graded products was greatest on the average when prices were relatively low, indicating that grading pays best on a heavily supplied market. Rigid grading did not materially quicken sales. The additional costs of rigid grading can be reduced with experience. "The difficulties of rigid standardization are so great with perishable agricultural products as compared to most industrial products that the additional costs appear to be relatively high.

These additional costs must be returned to producers if they are to accept such standardization."

Farm land and debt situation in Iowa, 1935, W. G. Murray and W. O. Brown (*Iowa Sta. Bul. 328 (1935), pp. 32, figs. 11*).—The present situation in Iowa as to corporate-owned land, farm mortgage indebtedness, farm mortgage foreclosures, tenancy, and land values is described and discussed, and comparisons are made with previous years.

Tax burden on forest land reduced, P. A. Herbert (*Michigan Sta. Quart. Bul., 17 (1935), No. 3, pp. 145–147*).—A table shows the assessed value and the total taxes per acre in 1932 and 1933 (before and after the State constitutional amendment placing a 15-mill limitation on taxes on rural property) on 31 cut-over forest tracts in 9 counties. The taxes per acre varied from 5.5 to 29 ct. in 1932 and from 4 to 14.5 ct. in 1933, the savings ranging from 10 to 64 percent.

Insurance practices of farm families (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 39, 40*).—The percentages of 100 owner and 100 tenant farm families carrying personal and property insurance are given.

RURAL SOCIOLOGY

[Investigations in rural sociology at the Michigan Station, 1933–34] (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 44–47*).—Data are reported on studies of the rural church as a social institution in Eaton and Ingham Counties, excluding the city and township of Lansing and the city of East Lansing; a study of 240 native-born families deriving their annual income from the farm; and a study of 12 rural communities in the Michigan Peninsula.

Montana county organization, services, and costs, R. R. Renne (*Montana Sta. Bul. 298 (1935), pp. 119, figs. 25*).—"The purpose of this bulletin is to make essential information available to taxpayers so that they may better understand how to adjust their county governments to changing economic conditions. More specifically, this bulletin includes an analysis of the organization, services, receipts, and expenditures of Montana counties in order to (1) help farmers and others to understand better the services rendered them by county governments in return for their tax contributions; (2) show the trend in services, revenues, and expenditures of counties from pre-war days to the present time, and explain the changes that have occurred; (3) establish some standards which can be used to measure the reasonableness of the costs of the various county services; and (4) suggest plans for greater efficiency in county governments."

The general features of county organization in the State, county administration, the general county services, the services of individual officers, county receipts and expenditures, efficiency of the county governments, and the relations of various factors to efficiency are described and discussed. The problem of improving county government is discussed, and suggestions are made for a reorganization program.

Rural relief, C. E. Lively (*Ohio Sta. Bul. 548 (1935), p. 88*).—Statistical data gathered in cooperation with the Federal Emergency Relief Administration in Ashtabula and Carroll Counties are presented.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1934–35, M. A. Agnew (*U. S. Dept. Agr., Misc. Pub. 214 (1935), pp. V+124*).—This is the usual annual list (E. S. R., 71, p. 556) showing the workers in agriculture and home economics.

FOODS—HUMAN NUTRITION

The study of human nutrition: The outlook to-day, F. G. HOPKINS (*Jour. Roy. Soc. Arts, 83 (1935), No. 4303, pp. 572–591*).—In this Trueman Wood lecture before the Royal Society of Arts, Great Britain, a brief historical survey is first given of the growth of scientific knowledge of nutrition from Hippocrates to Atwater. This is followed by an appraisal of the sources and value of present knowledge of the food constituents now known to be necessary to adequate nutrition. Proteins are discussed chiefly with regard to the significance of the term first-class proteins, carbohydrates and fats from the standpoint of their interlocking functions in the body, vitamins in their general relationship to hormones and their diverse chemical structure, and minerals as divisible into two classes—those required for a structural purpose, such as calcium and phosphorus for bone formation, and those required for the stimulation of active processes in the tissues, such as manganese and copper.

Without minimizing the value of animal experimentation in determining the nutritional needs of the body and the practical value of the knowledge already obtained, the author expresses his belief that "the position of nutritional studies at the moment calls urgently for further experimental research on human material in controlled conditions. This is necessary for putting our present knowledge on the soundest possible basis and for advancing it on desirable lines. The results of such experiments, moreover, are more apt to bring conviction to the majority than those done on animals. They call, however, for much organization, and they need to be prolonged. They therefore need considerable financial support." Problems for research on human beings are suggested by the following statements:

"We do not yet know the optimum intake of calories for children of different ages; our data for determining the needs for first-class protein in various circumstances are vague, and this is a matter of economic importance. Moreover, in the case of human beings, the optimum supply of individual vitamins is still uncertain. We do not know what beneficial modifications of a dietary may be made at special periods of life, as at puberty, for instance, or in the case of a pregnant woman. These are merely instances of knowledge yet to come."

The study of human nutrition: The outlook to-day, F. G. HOPKINS (*Brit. Med. Jour., No. 3872 (1935), pp. 571–577*).—This is an abridged form of the lecture noted above.

[Planning a national food policy] (*Planning, No. 44 (1935), pp. 1–11*).—The need for planning a national food policy for Great Britain is discussed from the nutritional aspect, with illustrations of the extent to which research has outrun practice and of the type and scale of adjustments which may be required in the near future. The application of the newer knowledge of nutrition to national food planning is thought to be hindered by problems of technic in biological measurements and analysis, the absence of satisfactory standards for detecting malnutrition, and incomplete adjustment of production to meet consumption demands.

The problem is considered "too big to tackle one-sidedly and too important to be left to the slow and laborious processes of haphazard adoption. Resources proportionate to the magnitude of the issue must be brought to bear on finding a solution. In the first place, the basic research which has produced the revolutionary discoveries should be followed up by more particularised research, aiming to indicate further practical applications, and by intensified pilot or development research, involving the testing of specific diets among different groups of people in different circumstances. The objects of such research would be to confirm laboratory discoveries, to suggest promising new lines

of laboratory work, to develop objective biological standards of satisfactory scientific accuracy and simple enough for general use, and to show more clearly the implications of the new knowledge in terms of production, distribution, public health, and other activities."

Problems of human nutrition (*Nature* [*London*], *135* (*1935*), *No. 3409*, *pp. 321, 322*).—This editorial comments chiefly on the lecture of F. G. Hopkins and the issue of *Planning* noted above.

[Studies in foods and nutrition], H. McKay and M. B. Patton (*Ohio Sta. Bul. 548* (*1935*), *pp. 81–83*).—Progress reports are given on a continuation of the studies on the food habits and physical development of preschool children (E. S. R., 71, p. 422) and the basal metabolism of women over 35 yr. of age (E. S. R., 71, p. 423), and on a comparison of the culinary properties of Ohio potatoes produced under different conditions of soil fertilization.

Passing an alternating electric current through food and fruit juices.—I, Design and use of suitable equipment. II, Cooking food and sterilizing fruit juices, L. E. Sater (*Iowa Sta. Res. Bul. 181* (*1935*), *pp. 273–312*, *figs. 14*).—In this complete report of an investigation noted from time to time from progress reports (E. S. R., 69, p. 143), the literature in the field is first reviewed, the various pieces of apparatus devised and constructed are described and illustrated, methods of testing the apparatus for its efficiency and the practicability in cooking various types of food are described, and data are reported on the time required for cooking vegetables in the new apparatus, with comments on their texture, flavor, and color; the time for cooking fruits for canning, with the flavor, color, and keeping qualities of the product; the time of cooking, the shrinkage, and appearance of beef, pork, and mutton; and bacterial counts on certain fruits and vegetables before and after heating to various temperatures and canning.

The author concludes that a large number of foods may be cooked by this method in a much shorter time than by present methods of cooking, with as good or better results in the case of fruits and most vegetables, but rather unsatisfactory results with meats except when covered with water. With fruit juices, the natural fruit flavor is retained to a greater extent than in ordinary methods of heating, but the temperatures required for good keeping qualities vary widely. Cider and grape juice appeared to be sterilized sufficiently at temperatures of 60°–70° C., but tomato juice containing pulp could not be sterilized at temperatures below boiling. The current densities produced brought about no appreciable destruction of *Bacterium coli* or spores of *Bacillus subtilis* when the final temperatures were sublethal.

The effect of the wrapping material on the fat of fatty foods.—II, The effect of sunlight passing through transparent wrappers of various colours (cellophane) and some transparent papers, W. L. Davies (*Jour. Soc. Chem. Indus., Trans., 53* (*1934*), *No. 20*, *pp. 148T–151T*, *fig. 1*).—In continuation of the investigations noted previously (E. S. R., 73, p. 97), eleven samples of variously colored cellophane were examined for actinic properties in a Lovibond tintometer and a Hilger wavelength spectrometer. With the latter, the samples were consecutively doubled until total absorptions were reached. The cellophane samples and other wrapping materials of a translucent nature were investigated for their protection against the rate of autoxidation by sunlight of the fat of various materials. Three methods were used involving the protective action of the coverings against (1) the rate of bleaching of an acetone-methylene blue solution, (2) the rate of bleaching of methylene blue solution in milk and sodium oleate, and (3) the rate of autoxidation of butterfat and cracker meal.

The samples of cellophane could be divided into three classes: (1) Those which did not appreciably absorb the active rays, including colorless, light blue,

pink, orange, and lemon; (2) those which showed considerable absorption, including heliotrope and light green; and (3) those which showed complete or almost complete absorption, including deeply colored green, blue, brown, and red samples. Of the other materials tested, vegetable parchment allowed very little actinic light to pass through, greaseproof paper about as much as the cellophanes of group 2, and transparent paper nearly as much as those of group 1. The results with wax paper were anomalous.

In the spectroscopic tests, the absorption of chemically active rays could be correlated with the depth of color in Lovibond units and the extinction coefficient with the absorption in the region of 4,000γ to 5,000γ by one thickness, and the rate of increase of extension in this region by increasing the number of thicknesses of the cellophane.

The group 3 samples of cellophane prevented an appreciable increase in the peroxide oxygen of the fat of cracker meal even after an exposure to direct sunlight for 40 hr., those of group 2 prevented autoxidation to a slight extent, and those of group 1 showed no protection. The findings with the other materials gave good agreement except for wax paper. Although this was opaque to actinic rays, it did not prevent the oxidation of dry fatty food. It is thought that volatile products of the autoxidation of the wax were responsible for initiating the autoxidation of the fat of the wrapped food.

In regard to the use of colored cellophane for preserving the fat of fatty foods, it is thought that the depth of the color rather than the actual color is of importance.

A simple apparatus for metabolic measurements on small animals, M. L. Tainter and D. A. Rytand (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 361–363, fig. 1*).—A simple apparatus for measuring the metabolic rate of small laboratory animals is described and illustrated.

"It requires no unusual materials and can be made in a few hours by anyone able to solder. Its accuracy and simplicity are derived from the fact that by keeping the size down to a minimum the contained gas volume is very small, and the necessity for rigorous temperature control and circulation of the air is thereby eliminated. The values reported in the literature, with more complicated apparatus and groups of animals measured over longer intervals of time, are reproducible in this simple apparatus, using single animals and observation periods of relatively few minutes."

Variation of basal metabolic rate per unit surface area with age, M. Molitch and R. F. Cousins (*Jour. Nutr., 8 (1934) No. 2, pp. 247–251, fig. 1*).—Basal metabolism data in calories per square meter of body surface per hour are reported by age groups from 9 to 18 yr. for 200 boys. The majority of the subjects were between 12 and 16 yr. of age.

The data show the same irregularity in the decrease of metabolic rate with increased age related to puberty as noted by Bruen (E. S. R., 70, p. 872). The figures are lower than those for the same age groups reported by Aub and DuBois and Boothby and Sandiford, but the range of the majority of cases shows fairly good correlation with the Dreyer standards.

The influence of previous diet, growth, and age upon the basal metabolism of the rat, K. Horst, L. B. Mendel, and F. G. Benedict (*Jour. Nutr., 8 (1934), No. 2, pp. 139–162*).—This is a continuation of the comprehensive investigation of the metabolism of the rat under various conditions (E. S. R., 72, p. 131).

The change from a synthetic diet to one of natural foods produced in rats from 91 to 196 days of age a temporary increase in metabolism, but after long periods of feeding the differences were insignificant. There was practically no difference in the basal metabolism of rats fed diets of high protein and medium

protein content, but rats on an extremely low protein diet had a lower metabolism and showed on autopsy a deleterious effect from the low protein.

The basal metabolism of young rats stunted in growth by feeding an insufficient quantity of a normal diet was lower than that of normal rats of the same age and larger weight and of normal rats of the same weight but different ages. On realimentation and resumption of growth, the basal metabolism returned to normal. The rate of growth, whether slow or rapid, as produced by differences in yeast content of a synthetic diet, had no appreciable effect on the basal metabolism of male rats except as calculated per unit of surface area. Under these conditions the metabolism of the rapidly growing animals was somewhat higher than that of the slow growing from 40 to 100 days of age and slightly lower than that of the slow growing animals at from 230 to 300 days of age.

Male rats in the second and third year of life had a higher metabolism than females of the same age, and in both sexes the metabolism remained practically constant during this period.

The effect of sleep on human basal metabolism, with particular reference to south Indian women, E. D. Mason and F. G. Benedict (*Amer. Jour. Physiol.*, *108* (*1934*), *No. 2*, *pp. 377–383*).—The possibility that the very low basal metabolic figures reported for a group of native women in south India (E. S. R., 66, p. 688) may have been due to a greater relaxation than is customary among Occidentals was investigated by determinations of the basal metabolism of 4 of the subjects of the earlier study and 3 others while asleep. For purposes of comparison, 2 Occidental women were studied under the same conditions. Every precaution was taken to have strictly comparable conditions except for sleep for subjects awake and asleep.

The data of the Indian subjects show a consistent decrease in oxygen consumption during sleep, averaging 9.8 percent and varying from 5.8 to 15.5 percent with depth of sleep. These changes, which were also obtained with the 2 Occidental women, were of the same magnitude as have been reported in other studies for Occidentals.

This is thought to confirm the earlier conclusion that south Indian women have a very low basal metabolism when awake and that this is not due to a state of relaxation.

Prolonging the life span, C. M. McCay and M. F. Crowell (*Sci. Mo.*, *39* (*1934*), *No. 5*, *pp. 405–414*, *figs. 3*).—This paper discusses in greater detail, with further data, the hypothesis noted previously (E. S. R., 69, p. 752) that longevity is not compatible with rapid growth. The data presented are considered to indicate: "(1) That the life span of the rat is extended if the growth of the animal is retarded by inadequate calories and if an adequate intake of other essential nutrients is insured, (2) that the potential life span of an animal species is unknown and greater than we have believed, (3) that the difference in growth rates of the opposite sexes within a species may account for the differences in life span, (4) that the problems of longevity can be attacked profitably today by means available in most nutrition laboratories."

Photographs are included of slow-growing and rapid-growing rats at the ages of 900 days and 2 yr. 8 mo.

Food consumption and use of time for food work among farm families in the South Carolina Piedmont, A. M. Moser (*South Carolina Sta. Bul. 300* (*1935*), *pp. 80*).—The primary purpose of this investigation was to discover the pattern and money value of adequate dietaries for white and negro families in the Piedmont section of the State, and the extent and variety of home production of food for family use. Three types of records, distributed fairly evenly throughout the year, were obtained in five counties of the section, including

detailed records of food consumption for 1 week, records of time consumed in the food activities in which the homemaker played an important part, and general information to aid in the interpretation of both food and time records. The records considered sufficiently accurate for analysis numbered 178 white households, where 104 were owners or part owners, 21 croppers, and 53 other tenants, and 97 negro households, where 22 were owners and part owners, 42 croppers, and 33 other tenants.

The diets were analyzed for adequacy in the various food essentials and divided into three grades as follows: Grade A, or fully adequate, if each of the food essentials made or exceeded the requirements of the household group according to specified standards; grade B, or restricted, if the nutrients fell below standard in one or more respects, but provided at least two-thirds of the standard; and grade C, or seriously deficient, if one or more nutrients provided less than two-thirds of the standard. As thus classified, 90 white and 24 negro diets fell in grade A, 71 and 43 in grade B, and 17 and 30 in grade C. Grade A diets were decidedly higher in milk, potatoes, tomatoes, and citrus fruits than the diets of grades B and C. In the negro diets, lean meat, fish, and poultry were higher in grade A than in the other diets. The grade A diets of white families were higher in cereals, milk, and sugar than either the minimum cost of moderate cost standard diets of Stiebeling and Ward and between these two in lean meat and eggs, in fats, in green, leafy, and yellow vegetables, and in fresh fruits and vegetables as a group, but lower than either in tomatoes, citrus fruits, and potatoes.

In the adequate diets for both groups, an average of 26 percent of the iron came from cereals, 25 percent from vegetables and fruits, 20 percent from sugars (chiefly sorghum sirup), and 15 percent from meat, fish, and eggs. An average of 71 percent of the calcium came from milk and cheese, the value rising with an increase in the money value of the diet. Milk and cheese furnished 45 percent and cereal products 31 percent of the phosphorus. Sweetpotatoes furnished 38 percent, milk and cheese 23, and leafy, green, and yellow vegetables 20 percent of the vitamin A. During the spring and summer months milk and its products were the most important source of this vitamin, but in the fall and winter months yellow sweetpotatoes contributed a much greater share. Green, leafy, and yellow vegetables (calculated in the raw state) contributed 58 percent of the year's supply of vitamin C in the adequate diets, but in the summer months tomatoes and fresh fruits were a more important source. Throughout all seasons milk and cheese furnished the largest share of vitamin G, contributing 65 percent of the total, with the two groups, vegetables and fruits and meat, fish, and eggs next in importance, with averages of 18 and 16 percent, respectively.

At 1932 prices, the average retail money value of the adequate diets for white households was 23.9 ct. and for the negro households 19.9 ct. per capita per day. The former value is between the minimum cost and moderate cost diets of Stiebeling and Ward and the latter near the minimum cost level. The average costs of all diets were 21.6 and 15.2 ct. per capita per day for the white and negro households, respectively. Home-produced food contributed on the average for all diets 83.4 percent of the retail money value of the foods consumed in the white and 83.6 percent in the negro households. In the grade A diets, the values were 84.4 and 86.8, grade B 82.7 and 83.9, and grade C 80.3 and 78.7 percent, respectively. Families whose diets were adequate owned more cows, pigs, and chickens and more fruit trees, raised more vegetables, and preserved more food for winter use than those whose diets were inadequate.

The inadequate diets of the white families were more frequently below standard in iron than in any other nutrient. The most serious deficiency in

the negro diets appeared to be vitamin G and/or the pellagra-preventive factor and next vitamin C. All of these deficiencies could be met by home-produced foods. It is emphasized that "improvement of the Piedmont rural family diet calls for increased production and use of milk and of vegetables and fruits at all seasons of the year. Lean meat and eggs could very well be increased, but they are not as essential as are milk and vegetables. Individual foods of special value at the lower levels of cost include potatoes, legumes, tomatoes, green leafy vegetables, sorghum molasses, and whole grain cereals, as well as milk."

As a help in quantitative food planning, weekly diets for individuals of different food requirements have been constructed at the cost and nutritive levels of the adequate diets for the white families, with the percentage composition of the food groups following that found in the present study.

Satisfactory weekly records of time used in food activities were kept by 115 of the white and 70 of the negro households. In the white households, averaging 6.74 full-time individuals at meals, the time spent per week by all workers was 31.3 hr. for household food work and 20.1 hr. for farm food work connected directly with food production for home use. Corresponding figures for negro households, with an average of 7.32 full-time individuals, were 25.4 and 18.4 hr. In the white households adequate diets did not consistently require a greater amount of time for food activities than did inadequate, but the negro households which had adequate diets spent a greater amount of time in food production for home use than did those which had less satisfactory diets. The number of fresh fruits and vegetables was more directly responsible for an increase in time than items in any other food class. Diets with higher money value than the average had a relatively high time requirement for all food activities.

Summary tables are given throughout the text and detailed data in the appendix.

Farm family diets in the South Carolina Piedmont, A. M. Moser (*South Carolina Sta. Circ. 53 (1935), pp. 31*).—This circular presents in a nontechnical form the principal findings in the investigation reported in detail in the bulletin noted above, with special reference to a planned home food production to meet as far as possible the requirements of a satisfactory and adequate diet for the section of the State studied. The records are discussed from the standpoint of frequency of deficiencies, with the significance of each, and the food sources of the nutrients in the diets found to be adequate.

Three actual weekly records are considered in some detail. Two of these represent adequate, although not ideal, diets costing less than 15 ct. per capita per day at 1932 retail prices, one being that of a negro and the other a white household. The third represents a well-balanced diet for a week in the winter at a cost of 24 ct. per capita per day.

The percentages of the total quantities of different foods produced at home and the money values of these foods are given.

Actual food budgets, based upon the diets found adequate in the present study and the recommendations of Stiebeling and Ward for adequate moderate-cost and low-cost diets, are also presented, with suggestions for food selection within each group for economical nutrition. An appendix contains tables of food requirements for individuals of both sexes and different ages and food plans in quantities per week at two levels of nutritive and money value for various age groups.

Studies on the nutrition of children (*Michigan Sta. [Bien.] Rpt. 1933–34, p. 39*).—This progress report summarizes preliminary findings in a study of nitrogen, magnesium, and phosphorus metabolism in a group of preschool children on diets furnishing protein at two different levels.

A study of the food habits and the nutritional status of children in selected communities in Maine, M. M. CLAYTON and M. D. SWEETMAN (*Maine Sta. Bul. 377 (1934), pp. 405–407*).—This progress report discusses the scope of the investigation and presents preliminary findings in the analysis of physical examination records of 677 children.

Food consumption of preschool children, M. M. BRAY, J. E. HAWKS, and M. DYE (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 4, pp. 309–316; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 3, p. 163*).—This contribution from the Michigan Experiment Station reports data on food intake of a group of nursery school children, including 8 boys and 12 girls ranging in age from 33 to 61 mo. A trained worker weighed on 3 or 4 single days at different times of the year all of the food each child ate, both at home and at the nursery school, and a duplicate of each day's diet was analyzed for calories, protein, calcium, and phosphorus. The data, covering a total of 60 days, were reported as averages and ranges for three age groups, 30 to 41, 42 to 53, and 54 to 65 mo., and averaged for the boys and girls separately.

The average weights and percentages of total calories furnished by the most important food groups were milk 669 g and 32 percent, eggs 42 and 4.3, cheese and meat 21 and 4, cereals 153 and 17.3, fruits and vegetables 396 and 15.6, sugar 28 and 7.4, and fat 30 g and 19.2 percent, respectively. The total calories averaged 1,404 and calories per kilogram of body weight 78 daily, protein 45.3 g and 2.5 g, calcium 1.068 and 0.059, and phosphorus 0.989 g and 0.055 g, respectively.

The milk consumption of more than half of the children varied between 1 and 3 pt. daily. In only five of the daily records, representing 3 individual children, did it approximate 1 qt. "The average amounts of other foods eaten daily were as follows: 1 egg, a small serving of either meat or cheese, from 1 to 2 dishes of cereal, 4 fairly large servings of fruit or vegetable, and about 1 oz. of sugar and 1 oz. of butter. Very few of the children had olives or pickles. They had only small amounts of candy and practically no rich desserts. In general, the preparation of their food was simple."

The differences on isolated days between the food values as obtained by analysis and by calculation from tables of food values varied from 0 to as much as 46 percent. The mean values, however, varied only from 0.4 percent for protein to 7.8 percent for phosphorus. The coefficients of correlation between the two sets of data were fairly high.

The effect of improved diet on children with a moderate degree of hookworm infection, O. D. ABBOTT (*Jour. Home Econ., 26 (1934), No. 9, pp. 577–580*).—This contribution from the Florida Experiment Station describes the beneficial effects of improved diet for a period of 7 mo. on two children suffering from moderate hookworm infection. The children, two sisters who had been living in a county detention home in a city, were removed to the home of a county welfare officer for the period of the experiment. In addition to three meals daily with the family they received weekly supplements of 2 doz. eggs, 24 large cans of evaporated milk, and fresh fruit ad libitum, with 4 cc of cod-liver oil daily for each subject.

Physical examinations at the beginning and end of the period showed improvement in all of the outstanding defects noted at the beginning—conjunctivitis, edema, heart defects, and anemia. A decided increase in physical and mental energy was also noted. Although it is admitted that the change in environment, personal hygiene, and dicipline contributed to the improvement, the change in diet is considered to be the most important factor in mitigating many of the clinical symptoms of hookworm infection. "In any community were nutritional anemia and hookworm are endemic and where reinfection is

common, the maintenance of children on a high plane of nutrition is imperative."

The supplementary value of dry skim milk in institution diets, L. J. Roberts, LaV. Carlson, and V. MacNair (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 4, pp. 317–324, fig. 1*).—The supplementary use, chiefly in cooking, of about 5 lb. of dry skim milk daily for a period of 3 mo. in an institution of 32 children was found to result in no significant change in the calorie value of the food consumed from that at the beginning of the period or from that of a similar institution serving as control. There was a striking improvement, however, in the quality of the diets in the experimental period, for the use of the dry skim milk in cooking released for beverage purposes a considerable part of the liquid milk, which was purchased in amounts providing approximately 1 pt. per person per day. The increase in milk amounted to the equivalent of ½ qt. or more for 28 of the 32 children, with corresponding increases in the calcium and protein, as well as in the phosphorus and vitamin G content of the diet. The cost of the improvement in the diet amounted to not over 50 or 75 ct. a day for the entire institution.

The supplementary relationships between the proteins of wheat and rye breads and those of the pea (Pisum sativum), Z. Markuze (*Biochem. Jour., 28 (1934), No. 2, pp. 463–466*).—In this extension of studies noted previously (E. S. R., 67, p. 620), the biological values of the proteins of wheat gluten, of rye bread baked from 70 percent rye flour, of pea meal prepared by boiling, drying, and grinding peas, and of mixtures in various proportions of the pea meal with wheat rolls, rye bread, and wheat gluten were determined by the same method. In all of the combinations tested, higher biological values were obtained with a mixture of pea meal and the other proteins than with the proteins of the separate components.

The biological values of proteins.—V, The comparative biological values of the proteins of whole wheat, whole maize, and maize gluten, measured by the growth of young rats, M. A. Boas-Fixsen, J. C. D. Hutchinson, and H. M. Jackson (*Biochem. Jour., 28 (1934), No. 2, pp. 592–601, figs. 2*).—In this continuation of the series of studies noted previously (E. S. R., 69, p. 895), the possibility that the proteins of whole wheat, whole corn, and corn gluten, although shown to be of practically equal value for maintaining nitrogenous equilibrium for a short time in adults, may be of unlike value for the growing animal was tested by determining the biological values of the proteins from the three sources by the rat growth method of Osborne and Mendel in which the ratio $\frac{\text{grams gain in weight}}{\text{grams protein ingested}}$ is the numerical expression of biological value. Attention was also paid to the observation of Mitchell that this ratio does not take into account the protein requirement for maintenance as apart from growth. To allow for this, the amount of 10 g is subtracted from the denominator of the fraction as a fair estimate of maintenance requirement apart from growth. With this correction, the biological values obtained were 1.85 for the proteins of wheat and 1.73 for those of corn, either in the cooked or raw state. No simple relationship was shown between the weight increase and protein intake with the yellow and white corn glutens tested, although the estimated value was lower than that of the proteins of the whole grain.

The similarity between the nutritive values of the proteins of whole wheat and whole corn for the support of growth in the young rat is in agreement with the previous findings for maintenance of the adult rat.

Factors influencing the utilization of calcium and phosphorus of cow's milk, J. H. Hess, H. G. Poncher, and H. Woodward (*Amer. Jour. Diseases Chil-*

dren, 48 (1934), No. 5, pp. 1058–1071, figs. 2).—This paper reports a metabolism study conducted on a normal negro male infant 80 days old at the beginning of the experiment, with a view to determining whether the amount of calcium and phosphorus remaining in milk after treatment by base exchange, according to the method of Lyman, Browne, and Otting, noted on page 437, is sufficient to keep a normal infant in positive calcium and phosphorus balance. The study consisted of four experimental periods of 12 days each and one of 6 days, during which the feedings consisted, respectively, of whole boiled cow's milk, base exchange treated boiled milk, whole boiled milk with citric acid (0.6 g per 100 cc milk), base exchange treated powdered milk (13.5 g), and whole boiled cow's milk. Boiled tap water was used in making up the formulas, which included lactose 8 g, orange juice 6 cc, milk 100, and water 75 cc per kilogram of body weight.

The subject was in positive calcium and phosphorus balance during all of the feedings. In the period in which the milk treated by base exchange was used, the percentage retentions of calcium and phosphorus were higher than in the control periods, but the absolute quantities retained per kilogram body weight were not strikingly increased. In the period of acidified milk, the retention of calcium and phosphorus was higher than in the control period, but the retention and total balances were lower than in the period on milk treated by base exchange.

The more efficient utilization of calcium and phosphorus on the base exchange milk is attributed to three factors, (a) the smaller size of the curd, (b) the larger proportion of ultrafiltrable calcium, and (c) the larger amount of fixed base in the ash of the milk. It is concluded that all three factors must be influenced favorably to obtain maximum retention of calcium and phosphorus on minimum feeding of milk.

Observations upon the absorption of calcium in normal animals, N. B. Taylor, C. B. Weld, and J. F. Sykes (*Brit. Jour. Expt. Path., 14 (1933), No. 5, pp. 355–366, figs. 8*).—Essentially noted from a preliminary report (E. S. R., 69, p. 312).

Effect of calcium and phosphorus in diet of mothers upon weight of young, W. M. Cox, Jr., and M. Imboden (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 313, 314, fig. 1*).—Virgin female rats weighing approximately 200 g at 100 days of age were allowed to raise a first litter on stock food, then remated at the end of 21 days' lactation and placed on an experimental calcium-phosphorus-free ration supplemented with various salt mixtures furnishing Ca : P ratios of from 0.1 to 10 and actual percentages of calcium of from 0.245 to 2.45 percent. The litters were reduced to 6 at birth and at the end of 21 days were killed and the mothers again remated, the procedure being repeated through 10 successive gestations and lactations. The success of the rats was gaged by the average weights of the young at 21 days of age through 10 reproductive cycles.

At the lowest level of calcium the largest rats were raised at a Ca : P ratio of 0.5, and at the highest level at a Ca : P ratio of 2. The largest average weight of a litter at 21 days was at a calcium percentage of 0.49 and a Ca : P ratio of 1. When the results of the four lowest levels of calcium were averaged, the optimum Ca : P ratio was also very close to 1.

As each level of calcium used showed a maximum weight of young at a different Ca : P ratio, it is concluded that no one optimum ratio can be stated unless the actual quantity of calcium is known. "The level of calcium in a diet, therefore, determines what level of phosphorus, i. e., what Ca : P ratio, is optimal."

The effect of fluorine on calcium and phosphorus metabolism in albino rats, E. M. LANTZ and M. C. SMITH (*Amer. Jour. Physiol., 109 (1934), No. 4, pp. 645–654, fig. 1; abs. in Arizona Sta. Rpt. 1934, pp. 68, 69*).—This comparison of the calcium and phosphorus metabolism of albino rats of various ages fed a diet to which sodium fluoride at levels of 0.05 and 0.1 percent had been added with that of matched rats given the same diet with no fluorine is part of the extensive investigation at the Arizona Experiment Station noted previously (E. S. R., 72, p. 726).

Growing rats fed the diet containing 0.1 percent of added sodium fluoride retained much less calcium and somewhat less phosphorus than the controls, whether the values were expressed as total quantities, percentages of intake, or milligrams per gram of body weight. The proportion of calcium retained was much less than of phosphorus. The Ca : P retention ratios for the controls averaged slightly above 1, but were as low as 0.54 for the younger animals in the fluorine-fed group. As the animals grew older the differences were less marked. In the growth-stunted fluorine-fed rats the period of calcification was extended over a long time, with the result that the Ca and P retentions calculated to body weight equaled or exceeded those of the controls in the older animals.

The fluorine-fed animals excreted far more calcium and more phosphorus in the feces than the controls. The fact that more calcium than phosphorus was excreted by this path suggests the probability that fluorine affects the metabolism of calcium and phosphorus by interfering with the absorption of calcium. On the smaller dosage of sodium fluoride the same differences in calcium and phosphorus metabolism were noted, but in a much smaller degree.

[**Fluorine studies**] (*Arizona Sta. Rpt. 1934, pp. 68–72*).—This progress report (E. S. R., 70, p. 887) includes summaries of studies on the effect of fluorine upon the metabolism of calcium and phosphorus (noted above) and upon the eruption of the incisor teeth (E. S. R., 72, p. 726), its effect upon digestion and metabolism of proteins, the comparative toxicity of fluorine compounds (E. S. R., 72, p. 878), histological changes in the enamel of fluorine-fed animals (E. S. R., 71, p. 889), the effect of fluorine on the phosphatase content of blood, bones, and teeth, and the occurrence of mottled enamel in deciduous teeth.

The iodine content of hospital foods, V. V. COLE, G. M. CURTIS, and M. L. BONE (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 3, pp. 200–207*).—Data obtained by a modification of the Von Fellenberg method are reported on the iodine content of a number of foods used in the hospital of Ohio State University. The materials analyzed included both uncooked and cooked fruits and vegetables; milk, cream, and various dairy products; eggs and meats; and miscellaneous prepared foods. The eggs, milk, cream, butter, and cottage cheese came from the university dairy, fresh vegetables from local markets, and bread from a local bakery, using flour from Kansas wheat.

The local vegetables and fruits were all low in iodine content. The values for 4 individual eggs varied quite widely, but the calculated percentage content of the whole egg was remarkably constant. The foods analyzed entered into the diet of a goiter patient whose iodine intake for 4 days was calculated to be 161, 196, 168, and 207 gamma, respectively. The urinary iodine for the same days amounted to 121, 111, 103, and 108 gamma, respectively, the values showing no relation to the calculated intake.

The iron content of sorghum and sugar-cane sirups, O. SHEETS and A. F. SULZBY (*Jour. Home Econ., 26 (1934), No. 7, pp. 431–436*).—Data are reported from the Mississippi Experiment Station on the iron content, as determined by the authors' modification of the Kennedy method (E. S. R., 65, p. 891), of

individual samples of sorghum and sugarcane sirup which had been collected in glass bottles from the mills and evaporated in iron, porcelain, and copper pans. Data are also included on the H-ion content of a few samples of sorghum and sugarcane juices.

The average iron content of the sorghum sirups examined was 0.01473 percent and of the sugarcane sirups 0.0045 percent. Sirups evaporated in iron pans contained from 2 to 4 times as much iron as sirups made from the same lots of juice but evaporated in porcelain pans. The differences were slight between the sirups evaporated in copper and in porcelain pans. When prepared in the same way, the sorghum sirups contained from 2½ to 5 times as much iron as the sugarcane sirups.

The average pH values of the few juices tested were 4.96 for sorghum and 5.23 for sugarcane juice. The high acidities of the juices are thought to explain the dissolving of iron from the iron pans. Inasmuch as the greater part of the sorghum and sugarcane sirups prepared in the South is made on the farm on a small scale with the use of iron pans for evaporation, the sirups are relatively good sources of iron.

Iron and copper retentions in young children, A. L. Daniels and O. E. Wright (*Jour. Nutr., 8 (1934), No. 2, pp. 125–138*).—In 15 iron and copper balance studies conducted on 8 normal children from 4 to 6 yr. of age, iron retentions were found to vary from 0.12 to 0.25, with an average of 0.18, mg per kilogram of body weight, and copper retentions to vary from 0.012 to 0.048, with an average of 0.026, mg per kilogram of body weight. As diets furnishing 0.75 mg of iron per kilogram of body weight resulted in no higher retentions than those furnishing from 0.59 to 0.65 mg, the authors conclude that 0.6 mg of iron per kilogram body weight is sufficient for the maintenance and growth needs of normal children of these age groups. In the case of copper, however, higher retentions occurred at intake levels of from 0.09 to 0.093 mg per kilogram body weight than at the average intake level of 0.086 mg. For this reason the authors recommend not less than 0.1 mg per kilogram as the copper requirement for children of this age.

The accuracy of biological estimations of vitamins, K. H. Coward (*Analyst, 59 (1934), No. 703, pp. 681–685*).—The results obtained in the author's laboratory in a systematic investigation of the accuracy possible in biological estimations of vitamin A (E. S. R., 71, p. 5), vitamin B_1 (E. S. R., 72, p. 566), vitamin C (E. S. R., 67, p. 189), and vitamin D (E. S. R., 70, p. 882) have been assembled and expressed in the same form for comparison, in tables showing the accuracy of determinations from 10 animals in various vitamin tests and the probable error of comparison of two substances, e. g., a substance of unknown potency and the standard of reference, when 10 animals are used for testing each substance. The paper contains a brief explanation of the methods used in calculating the results, including the significance of standard deviation and standard error, the use of the standard error in determining the accuracy of a test, and methods of comparing an unknown with the standard and of comparing the calculations of various workers.

It is pointed out in conclusion that, although the inaccuracy of biological tests for vitamins is great and apparently inevitable, "a measure of this inaccuracy prevents the making of false comparisons by concluding that two results are different when indeed they are not, and it gives a known amount of confidence in results which one might otherwise be inclined to reject from a general distrust of biological tests."

Quantitative aspects of vitamin requirement, W. T. Salter (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 4, pp. 296–308*).—Although this review of recent literature deals chiefly with vitamin requirements as affected by the nature

of the diet and by preexisting disease. there is also a discussion of the twilight zone of vitamin lack or borderline conditions attributable to vitamin deficiency, the chemical identification and measurement of the vitamins, their storage, manufacture, and excretion, and the preparation of diets and food products of known vitamin content.

A list of 48 references to the literature is appended.

Vitamin studies on pears.—II, Vitamins A, B, and C in the Winter Nelis, D'Anjou, and Bosc after a short storage period, I. A. MANVILLE and F. G. CHUINARD (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 3, pp. 217–227, fig. 1*).—This extension of an earlier study (E. S. R., 70, p. 565) is summarized as follows:

"Under optimal storage conditions, the vitamin A value of the D'Anjou and Winter Nelis is 4 Sherman units per ounce, the Bosc 3 units. Under similar conditions the vitamin C value of the three varieties is as follows: Bosc, 2.5; D'Anjou, 4; and Winter Nelis, 3 units. There is no difference in the vitamin A and C values of the varieties studied that can be ascribed to the region in which the fruit is grown.

"Prolonged storage has a destructive effect on vitamins A and C, a continuation of 2 mo. after the fruit should be off the market causing a decrease in vitamin content of nearly 50 percent. The Winter Nelis, a later variety, is capable of preserving its vitamin potency better than the earlier D'Anjou.

"Minimal amounts of each of three varieties that must be fed to provide a steady gain in weight over a 56-day experimental period are as follows: Bosc, 12 g; D'Anjou, 10 g; and Winter Nelis, 6 g. On the basis of average weekly gains in weight, the unitage of these three varieties is as follows: Bosc, 12.5; D'Anjou, 7; and Winter Nelis, 26."

The prophylactic effect of vitamins A and D upon the prevention of the common cold and influenza, H. H. BEARD (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 3, pp. 193–199*).—Following a review of the conflicting literature on vitamins A and D as anti-infective agents, data are reported on the number and severity of colds in a group of 36 first-year medical students at New Orleans who took 9 tablets daily of a cod-liver oil concentrate for 1 yr.

The estimated number of colds among the entire group for the year preceding the study was from 175 to 200 and the reported number for the year of cod-liver oil concentrate medication 100, of which 32 were severe and 68 mild. A definite prophylactic effect was noted by 21 of the students, a slight effect by 4, and no effect by 11. During the period of treatment an epidemic of influenza appeared among the students of several Louisiana institutions. The same percentage (56 percent) of the students receiving the cod-liver oil concentrate contracted influenza as of another group of 100 students not taking the tablets. The author is of the opinion that the vitamin treatment was of definite value in preventing the onset and lessening the severity of colds, but was of no prophylactic value in influenza.

Fat-soluble vitamins.—XLII, The absorption and storage of vitamin A in the rat, C. A. BAUMANN, B. M. RIISING, and H. STEENBOCK (*Jour. Biol. Chem., 107 (1934), No. 3, pp. 705–715, fig. 1*).—This paper continues the series noted on page 533. Preliminary observations, together with evidence from the literature, having indicated that the primary storage depot of vitamin A is the liver, the effect of various factors on vitamin A storage in rats was studied by determinations of the vitamin A content of the liver with the antimony trichloride test.

On the regular stock ration only traces of vitamin A could be detected in animals under 3 weeks of age, after which, under favorable conditions, there was a rapid and regular increase in storage. At the end of about the seventh week the content of vitamin A amounted to about 206 blue units per liver.

If the vitamin A content of the mother's diet was increased during pregnancy, there was a slight increase in the vitamin A content of the new-born animals, but not nearly as great as when the mother's intake of vitamin A was increased during the lactation period. The livers of stock animals approximately 1 yr. of age contained from 2,000 to 8,000 blue units per liver, or from 200 to 800 units per gram. Respiratory infections were not necessarily prevented by high stores of vitamin A, and among some of the animals succumbing to such infections the liver storage was in the same range as in normal animals.

In vitamin A-depleted animals only 3 blue units of vitamin A daily sufficed for restoration of growth and the cure of xerophthalmia, but storage in the liver did not take place until the dose had been increased to from 25 to 50 blue units daily. In animals stocked with vitamin A and then kept on a diet deficient in vitamin A, the rate of depletion was found to vary directly with the amount in storage. When depleted rats were given varying amounts of vitamin A, the storage paralleled to a certain extent the amount ingested, but on the larger amounts never exceeded from 10 to 20 percent of the intake. When equal amounts of vitamin A were fed to normal and depleted rats, the storage was greater in the normal animals and inversely proportional to the state of depletion in the depleted animals.

The absorption and storage of vitamin A took place within 6 hr. after ingestion of the vitamin, but the losses due to destruction in the digestive tract were large. Although the growth and survival of rats on a vitamin A-deficient diet paralleled both the previous intake and the storage, growth was prolonged beyond the period that could be predicted on the basis of liver storage alone.

Absorption and storage of vitamin A (*Jour. Amer. Med. Assoc., 104 (1935), No. 3, p. 222*).—This editorial comment on the investigation noted above closes as follows:

"It appears that vitamin A, indispensable for normal function as well as for intact structure, is exposed to many uncertainties under ordinary circumstances of alimentation before it is stored in the body. Normal digestion and absorption of fats is a prerequisite to the utilization of this food factor. Both carotene and vitamin A can be prevented from entering the body by certain otherwise effective therapeutic agents. Furthermore, the recent studies show that it is easier to maintain those stores than to replenish them. These various observations still further confirm the biochemist in the view that A continues to merit careful consideration."

The transmission of vitamin A from parents to young in mammals.—III, Effect of the fat content of diet during pregnancy on the transmission of vitamin A to the foetal rat, W. J. Dann (*Biochem. Jour., 28 (1934), No. 2, pp. 634–637*).—An earlier investigation of the transmission of vitamin A to fetal rats following administration to the mother of carotene in large doses (E. S. R., 68, p. 863) has been repeated with graded massive doses of a vitamin A concentrate with similar results. Even when the rat received as much as 5,000 times the minimum amount of vitamin for storage before and during gestation, the livers of the young at birth contained only from 20 to 35 blue units, although the storage in the liver of the mother at parturition amounted to from 180,000 to 300,000 blue units.

A slight increase in vitamin A content of fetal livers occurred when the diet of the mother contained large amounts of fat. For ordinary ranges of variation in fat the increase, however, is considered negligible.

The development of xerophthalmia and the keratinization of epithelial tissue on withdrawal of vitamin A from the diet of the monkey (Macacus rhesus), guinea pig, rabbit, and adult albino rat, R. A. Hetler (*Jour. Nutr., 8 (1934), No. 1, pp. 75–103, pls. 4, figs. 6*).—Contrary to the completely negative

findings of Tilden and Miller (E. S. R., 65, p. 92) with respect to the development of xerophthalmia in monkeys deprived of vitamin A, typical xerophthalmia, with keratomalacia, was observed in both eyes of 1 of 27 monkeys fed a diet low in vitamin A, while the gastrointestinal lesions reported by Tilden and Miller to be characteristic of vitamin A deficiency in this species were lacking. Keratinization of the epithelial tissues was observed on histological examination in the eyes, ears, the maxillary sinuses, the turbinates of the nasal septum, the salivary glands, and the kidneys. The compact bones underlying the lining membrane of the bulla of the ear showed evidence of decalcification, and this was also observed in the ears of depleted rabbits. Guinea pigs, rabbits, and both young and adult white rats fed the same vitamin A-deficient diet developed xerophthalmia in most of the cases studied.

A comparison of the potency of certain materials in vitamin B (B_1) and in the vitamin B rat-growth factor found in whole wheat, N. HALLIDAY (*Michigan Sta. Quart. Bul., 17 (1935) No. 3, pp. 107, 108*).—In this continuation of studies on the new vitamin B factor previously reported as present in whole wheat (E. S. R., 72, p. 884), the author, with the assistance of M. Olson, tested various materials for their content of vitamin B_1 and the new factor, using the Chase and Sherman technic for vitamin B_1 and the author's method for the new factor.

A 25 percent alcohol extract of wheat bran contained about twice as much of vitamin B_1 as of the new factor. A 95 percent alcohol extract of wheat germ contained about equal proportions of the two factors, but on subsequent concentration vitamin B_1 was almost completely destroyed and there was no loss of the new factor. Samples of the international standard of vitamin B_1 and of vacuum-dried hog liver were rich in both factors. A sample of dried liver in use in the poultry department of the college gave negative tests for both factors. Fresh hog liver ground and dried in the air in the laboratory was almost completely lacking in vitamin B_1, but contained nearly as much of the new factor as the vacuum-dried material. Oats contained slightly more vitamin B_1 than alfalfa and considerably more than corn, while corn and oats contained about equal quantities and alfalfa very little of the new factor.

Milk from newly freshened cows on various rations proved to be surprisingly rich in vitamin B_1, 10 cc daily inducing nearly normal growth for the first 4 weeks. The ration rather than the stage of lactation appeared to affect the content of the new factor in milk. Milk from corn-fed and oat-fed cows ran closely parallel in potency, but milk from cows receiving alfalfa and silage was very low in this factor.

Presence of vitamin B_1 in the gastric juice, S. A. KOMARAV (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 398–400*).—The presence of vitamin B_1 has been demonstrated in pure normal gastric juice of the dog by means of curative tests on polyneuritic pigeons, using concentrates prepared from the protein-free filtrate of the juice by absorption on fuller's earth at pH 4.5, followed by extraction of the adsorbate with barium hydroxide. Curative day doses for pigeons were equivalent to from 100 to 200 cc of the gastric juice, containing, respectively, from 0.8 to 1.6 mg nitrogen and from 7 to 14 mg of organic material.

Bradycardia in the vitamin B_1-deficient rat and its use in vitamin B_1 determinations, I–VI, T. W. BIRCH and L. J. HARRIS (*Biochem. Jour., 28 (1934), No. 2, pp. 602–621, figs. 9*).—This paper, dealing with the application of the bradycardia test for vitamin B_1 first described by Drury et al. (E. S. R., 65, p. 595), is presented in six parts as follows:

I. *Determination of vitamin B_1 by the bradycardia method* (pp. 602–605).—The technic of estimating vitamin B_1 by the heart rate or bradycardia method

is described, with data on its application in determining the vitamin B_1 content of activated clay, yeast, marmite, and wheat germ. The method consists essentially in administering single doses of the sample to rats suffering from vitamin B_1 deficiency and measuring the heart rate at daily intervals for a few days. The magnitude and duration of the effect are proportional to the amount of vitamin given. Several levels of the material are tested with from 4 to 6 animals in each group, and the results are compared with a standard reference curve.

II. *Cure of convulsions in rats* (pp. 605-608).—The technic of Smith (E. S. R., 68, p. 281), modified by slight changes in the basal diet and procedure, has been found to give results in vitamin B_1 tests paralleling closely those obtained by the bradycardia method and showing remarkably close agreement in response between animals receiving duplicate doses. The method is recommended particularly for obtaining an approximate idea of the potency of different preparations, as in following the steps in the preparation of a vitamin B_1 concentrate.

III. *Determinations by the growth rate method* (pp. 608-613).—Conditions under which this method has been found to give the most consistent and satisfactory results are discussed. Sucrose is used as the carbohydrate to avoid risk of refection and the "light white" variety of casein to avoid the possibility of shortage of the Coward factor. In comparative tests the same quantity of vitamin B_2 is used. Comparisons between the standard and the unknown are made in the range where small additions of the vitamin have the greatest effect on the growth rate. The number of variables is considered to differ too much to permit the use of a standard dose-effect reference curve for different tests.

IV. *Comparison of the "bradycardia" and other methods of assay* (pp. 613, 614).—Data reported in parts 1 to 3 on the vitamin B_1 content of various materials, as determined by the methods described, and supplementary data obtained on the same materials with the pigeon head retraction method are compared, and the advantages of the bradycardia method are discussed.

Taking the activated clay standard as 100, the values for the other materials, as determined by the four methods, are yeast 18.8 by the bradycardia method, 19.3 by the convulsions method, and 20 by the growth rate method with rats and 18 by the pigeon head retraction method. Corresponding results for marmite are 8.3, 8.7, 9.1, and 8.5, and for wheat germ by the three rat methods 7, 6.9, and 7.2, respectively.

"Among the advantages of the heart rate method are its convenience, rapidity, simplicity, and economy, and the fact that it can be readily used for determining foodstuffs containing only small amounts of vitamin B_1 which are beyond the scope of the curative pigeon or rat (convulsions) method, and—when they contain starch and give rise to refection—the rat growth test."

V. *Application of bradycardia method to wheat products* (pp. 614-617).—As an illustration of the practical use of the bradycardia method for materials containing starch and giving rise to refection in growth rate tests, determinations are reported on the viamin B_1 content of white and brown bread and of whole wheat flours from wheat grown at the Rothamsted Experimental Station on plats fertilized in different ways. The data indicate only insignificant amounts of vitamin B_1 in the white as compared with the brown (whole wheat?) bread and no appreciable variations in the vitamin B_1 content of samples of wheat grown under different systems of fertilization.

VI. *Physiological significance of the bradycardia in vitamin B_1 deficiency* (pp. 617-619).—On the basis of previous studies by the authors and others

and new data showing a correlation between the fall in heart rate and the rise in lactic acid content of the blood in vitamin B_1 deficiency, the hypothesis is advanced that bradycardia is correlated with the accumulation of lactic acid in the system and that vitamin B_1 has the property of a coenzyme-like substance intervening in the chain of carbohydrate oxidation reactions.

The identification and determination of vitamin C in biological materials [trans. title], N. BEZSSONOFF and H. VAN WIEN (*Bul. Soc. Chim. Biol., 16 (1934), No. 7, pp. 1160–1175, figs. 3*).—The titration method for determining vitamin C described on page 437 has been compared with guinea pig feeding tests for a number of food materials and body tissues, with results leading to the conclusion that the direct determination with the Bezssonoff reagent of vitamin C in fresh extracts gives results corresponding in general to those obtained with the guinea pig, but that in the case of vegetables containing the vitamin in combined form, for example cabbage, a preliminary hydrolysis is necessary. In extracts of preserved vegetables, such as sauerkraut, the titration values do not correspond to vitamin C alone, but by a comparison with the curves for the dienol in question the correct values can be obtained. Among the comparisons reported are those for lemon juice and tomato juice. As determined by both the titration test and hitherto unpublished guinea pig tests by L. Randoin, the lemon juice was found to be about three times as rich in vitamin C as the tomato juice. The protective doses for guinea pigs were 2 cc for the lemon juice and 6 cc for the tomato juice.

Ascorbic acid in the eye-lens and aqueous humour of the ox, T. W. BIRCH and W. J. DANN (*Biochem. Jour., 28 (1934), No. 2, pp. 638–641, fig. 1*).—Essentially noted from a preliminary report (E. S. R., 72, p. 283).

Disappearance of vitamin C from the adrenals of scorbutic guinea pigs, A. E. SIEHRS and C. O. MILLER (*Jour. Nutr., 8 (1934), No. 2, pp. 221–227*).—In addition to observations noted in a preliminary report (E. S. R., 69, p. 619), data are given on an attempt to adapt an iodine method to the determination of reducing substances, including ascorbic acid, in the adrenals of guinea pigs after subsistence on a vitamin C-deficient diet for varying lengths of time. Although separate determinations of glutathione were not made, the data show a progressive decrease of all reducing substances, including ascorbic acid, during the onset of scurvy.

It is suggested that the prompt disappearance of ascorbic acid from the adrenals on a scorbutic diet and prompt reappearance when the diet is supplemented by vitamin C furnish a basis for a method of determining the vitamin C content of foods.

The relation of avitaminosis C to blood clotting, A. K. PRESNELL (*Jour. Nutr., 8 (1934), No. 1, pp. 69–74*).—The blood of scorbutic guinea pigs was found to have a longer clotting time, a smaller number of blood platelets and red blood cells, a smaller quantity of hemoglobin, and a greater proportion of serum than that of normal guinea pigs.

Interaction of vitamin D and dietary factors in the healing of rickets in rats, H. M. BRUCE and R. K. CALLOW (*Biochem. Jour., 28 (1934), No. 2, pp. 512–516, figs. 2*).—To throw some light on the exact effect of adding phosphorus compounds to the diet in the healing of rickets by vitamin D, two alternative approximations were tested with the use of actual data—additive and multiplicative effects. The combined antirachitic effect of changes in the mineral composition of the diet and of the simultaneous addition of vitamin D was found to be greater than the effect of the sum of the two acting separately, and to be more nearly proportional to the product of the two factors. Logarithmic formulas for multiplicative constants are presented.

Cereals and rickets.—The role of inositolhexaphosphoric acid, H. M. Bruce and R. K. Callow (*Biochem. Jour., 28 (1934), No. 2, pp. 517–528*).—Using the constants developed in the preceding study, the authors have compared the effects due to the addition to high calcium, low phosphorus rickets-producing diets of phosphorus as a component of the cereal itself, as disodium hydrogen phosphate, and as sodium or calcium magnesium inositolhexaphosphates. The diet consisted of 32 parts of a basal mixture and 68 parts of cereal. The cereal portion consisted of a mixture of 20 parts of yellow corn meal and 48 parts of white flour or oatmeal untreated, cooked, and treated with dilute acid, respectively. Preliminary experiments, using diets of low calcium, high phosphorus content, are also noted.

In the high calcium diet, the replacement of corn and wheat flour by oatmeal without other adjustments caused a slight healing of rickets. When the total phosphorus contents of the two diets were equalized by the addition of disodium hydrogen phosphate to the corn-white flour diet, the latter had a greater healing effect than the oatmeal diet. The diet containing oatmeal treated with hydrochloric acid had an antirachitic potency equal to that of the corn and white flour plus phosphate. These findings are explained on the ground that a large proportion of the phosphorus in oatmeal is in the form of inositolhexaphosphoric acid, which is not readily available, but which on hydrolysis with hydrochloric acid yields a more available form.

Other comparisons are reported which give further evidence that the differences between oatmeal, corn and white flour, and corn can be accounted for completely by differences in the total phosphorus content and the proportion of inositolhexaphosphoric acid. In the authors' opinion, the apparent rachitogenic effect of cereals when compared with other material of the same phosphorus content in diets of high calcium content is due to the fact that the cereal phosphorus is not in an available form. The relative proportions of phytin phosphorus and other phosphorus in cereals is considered to be of significance in diets used for vitamin D testing.

The clinical status of vitamin D milks, J. W. M. Bunker and R. S. Harris (*New England Jour. Med., 211 (1934), No. 25, pp. 1140–1147*).—This paper, presented before the International Association of Dairy and Milk Inspectors in October 1934, traces the early history of vitamin D, and discusses in chronological order of date of publication the literature on clinical tests of three forms of vitamin D milk—yeast milk, Zucker process milk, and irradiated milk. In the final comparison, the Zucker process milk is not included on account of lack of reliable clinical data. In regard to the other two types of vitamin D milk, the authors express the opinion that both are valuable in curing and preventing rickets when used in the amounts and in the manner usually indicated for infant feeding, that they are of practically equal value in terms of rat unit equivalent potency, and that because of this the milk of choice is that which has the larger unit value per quart. Suggestions for needed research are given as follows:

"Evidence is still needed concerning the apparent unusual requirement of the very young infant in respect to antirachitics; concerning the minimum antirachitic potency of milk required to protect surely all infants against rickets; concerning the potencies required, not only to protect infants or to cure rickets, but to insure the most desirable rapidity of the healing process." It is also thought that more evidence is needed concerning the value of vitamin D milk to the adult human consumer in general and the pregnant woman in particular. It is pointed out that the question remains unanswered as to whether there are qualities in any type of vitamin D milk which in the long run may prove undesirable.

The paper includes a tabulated summary of published clinical reports on vitamin D milks to October 1934 and a list of 25 references to the literature.

Studies on the effect of high doses of irradiated and non-irradiated ergosterol on the albino rat, J. T. HAUCH (*Jour. Nutr., 8 (1934), No. 2, pp. 163–186*).—Commercial preparations of irradiated ergosterol of exceptional vitamin D potency as standardized by the line test had no harmful effects on young and old rats when administered in doses of 46,500 times the therapeutic rat dose as a supplement to a stock diet containing bread and milk. Toxic symptoms were produced on a dosage 93,000 times the therapeutic, the symptoms being less marked and occurring later in very young animals than in older ones. An immediate toxic response followed a dosage 465,000 times the therapeutic dose in rats of all ages, although more marked in the adult animals. A change of the young rats to a rachitic diet, with the same dosages, made the animals more susceptible.

These and earlier experiments in which doses from 100 to 50,000 times the therapeutic were fed without harmful effects to rats on stock and rachitic diets, in some cases through six generations, led the author to conclude that "the toxic effects observed by others on relatively low dosages of irradiated ergosterol are due to the presence of a toxic substance other than the true antirachitic agent in appreciable amounts in the preparations tested. Whether the toxic effects observed by us on our commercial preparation, when given in very high doses, are due to a trace of this hypothetical byproduct or to the vitamin D substitute remains to be determined. Our results again indicate that the toxicity of a given irradiated ergosterol preparation is also determined in part by the character of the diet. In general, the more complete and better balanced diets act in a more protective manner."

Effect of heavy administration of viosterol on metabolism of the rat, C. I. REED (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 274–277*).—Large but not toxic doses of vitamin D as viosterol were found to produce an increase in the metabolic rate in normal rats similar to that previously reported for normal dogs (E. S. R., 70, p. 883).

Investigations of the growth-promoting properties of vitamin G concentrates, L. E. BOOHER, H. M. BLODGETT, and J. W. PAGE (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 599–605*).—The Bourquin-Sherman quantitative method of determining vitamin G has been used with active concentrates of the vitamin prepared as previously noted (E. S. R., 73, p. 154) in a study of the relation of vitamin G requirements to the body weights of growing rats. The results indicated that a given allowance of vitamin G will induce smaller rates of growth as the body size of the test animals is increased whether the increased size is due to the selection of animals at the beginning of the test period or to the growth of the animals as the test period is prolonged. To avoid this source of error in the quantitative determination of vitamin G, the authors use animals weighing not less than 50 or more than 60 g at the beginning of the test period and limit the test to 4 weeks. It is suggested that a flattening growth curve in vitamin tests may quite as well be due to increasing requirements of the vitamin in question with increasing age as to the absence of an unrecognized growth factor. "The ambiguity in the interpretation of a flattened growth curve can perhaps best be overcome by recourse to relatively pure sources of the known vitamins, so that addenda of these may be increased without appreciably increasing the addenda of the supposed new factor."

As an example of the application of the procedure suggested, experiments are reported in which the active concentrate of vitamin G and the crystalline vitamin B_1 preparation of Williams et al., noted on page 437, have been used as sources of vitamins G and B_1 (B) in the Sherman-Spohn vitamin B- (complex)

free diet. Growth was inappreciable when liberal quantities of both of these concentrates were administered, although with the same vitamin G concentrate and the 80 percent alcoholic extract of ground whole wheat which is used as the source of vitamin B in the Bourquin-Sherman vitamin G-deficient diet steady growth took place. This is thought to indicate that the 80 percent alcoholic extract of whole wheat contains in addition to vitamin B some other essential growth factor, and that the success of the Bourquin-Sherman method in the measurement of vitamin G values is dependent on the presence not only of adequate vitamin B but of this new factor. The new factor is shown to be more stable to heat than is vitamin B and to be insoluble in ether.

Variations in the potency of certain foodstuffs in the cure of dermatitis induced in rats by dietary egg white, H. T. PARSONS, J. G. LEASE, and E. KELLY (*Jour. Nutr., 8 (1934), No. 1, pp. 57–67*).—In this continuation of the series of studies noted previously (E. S. R., 71, p. 873), various substances were tested for their ability to cure or prevent egg-white dermatitis.

Of the materials tested, cooked pork kidney proved the most potent, as the quantity required for cure amounted to only one-sixth of the weight of the egg white in the ration. Cooked beef liver, pork liver, and beef kidney were curative in doses of about one-fourth the weight of the egg white, and dried yeast, dried egg yolk, wheat embryo, and milk in doses from 1 to 3 times the weight of the egg white. Practically negative results were obtained with spleen, heart, ovary, adrenal, blood, and hemoglobin. Lilly liver extract 343 was inactive and the residue left after its preparation active. The activity of raw liver or kidney was increased by cooking and not decreased by autolysis or extensive bacterial action. The activity was decreased by boiling the material with hydrochloric acid, 5 percent concentration, for 1 hr. and by prolonged heating, particularly in the dry state. It is concluded that the injurious action of the egg white does not depend on the destruction of some dietary factor within the ration mixture.

Studies of the raw egg white syndrome in rats, W. D. SALMON and J. G. GOODMAN (*Jour. Nutr., 8 (1934), No. 1, pp. 1–24, fig. 1*).—The data presented in this contribution from the Alabama Experiment Station supplement the work of other investigators, notably Fixsen (E. S. R., 66, p. 588) and Parsons and associates (see above), in demonstrating abnormal symptoms in rats on diets containing raw egg white as the sole source of protein, even when the diets contained only 18 percent (dry basis) of the egg white and in the fresh as well as the dried state.

The pathological symptoms observed are summarized as "furlike or woolly hair, alopecia, exfoliating dermatitis, hyperemia, skin hemorrhages, blepharitis, stomatitis, salivation, variable edema and erythema of the feet, symptoms of nervous disturbance, and finally hypochlorhydria, and some anemia." The skin lesions were more severe on low-fat diets than on diets containing 18 percent of butterfat or hydrogenated cottonseed oil or 0.2 cc of linseed oil per rat per day. The additional severity is attributed to a deficiency of unsaturated fatty acids in the low-fat diet.

If the diet contained not more than 18 percent (dry basis) of the raw egg white, the symptoms could be prevented by the addition to the diet of brewer's yeast, dried liver, or the extracted residue of each, but not by extracted casein, the extract or hydrolyzed residue of brewer's yeast, white corn, or baker's yeast. The materials tested which had curative properties for well developed cases of the disease included brewer's yeast, dried liver, milk, and extracted residue of brewer's yeast. Materials found ineffective were extracted casein, gelatin, extract of brewer's yeast, and dilute hydrochloric acid.

The concentrated egg white had a slight harmful effect, but did not produce the severe symptoms caused by raw egg white. This extract was less effective as a source of vitamin G than an extract of brewer's yeast.

The data are thought to indicate a positive harmful factor in raw egg white, which is antagonized by the protective substances. In discussing the similarity of the symptoms of the egg-white disease, vitamin G deficiency, and pellagra, it is pointed out that the pigmentation and dermatitis in the egg-white disease are even more typical of pellagra than are the symptoms of G deficiency, and that the use of a vitamin B adsorbate from white corn in a vitamin G-deficient diet for rats results in marked alopecia and generalized skin lesions which are rarely seen in similar experiments when the vitamin B adsorbate is prepared from brewer's yeast. This suggests the possibility of the presence of an injurious substance in the corn similar to that in the egg white.

TEXTILES AND CLOTHING

The micrometer caliper for measuring the thickness of wool fibers, R. H. BURNS (*Wyoming Sta. Bul. 204* (*1935*), *pp. 36, figs. 5*).—The micrometer caliper is compared with the microscopic method (E. S. R., 54, p. 596) and the weight-length ratio as methods for measuring the thickness of wool fiber, technic and errors in micrometer measurement are described, and the characteristics of the various microscopic and nonmicroscopic methods for measuring the fineness of wool are outlined.

The micrometer method gives a quick, average figure of fiber thickness which represents a considerable part of the fiber shaft in one measurement, and also obtains a variability between the thickness of the different fibers within the sample. It is particularly adapted to the analysis of large numbers of samples where an index of the variability of fiber thickness, as well as an average value, is desired. The microscopic method is useful in obtaining a definite picture of the fiber at any point or series of points along the shaft of the fiber, but entails a great amount of time and is thus not so suitable for the analysis of many samples. It is adapted to study of histological and physiological changes of fiber structure in a relatively small population of fibers. The weight-length ratio is adapted to the analysis of a large number of samples where an average figure is desired and where variability between samples is deemed of more importance than variability between fibers within each sample.

Quality guides in buying household blankets, B. M. VIEMONT and M. B. HAYS (*U. S. Dept. Agr. Leaflet 111* (*1935*), *pp. 8, figs. 2*).—This leaflet of the series noted previously (E. S. R., 71, p. 142) describes the properties of a good blanket in terms of warmth as determined by the kind of fiber, the napping, and the weave; of durability, as judged by the nature of the fabric, and end finishes and bindings; and of weight, appearance, and size. Some of the results obtained in the analysis of 22 household blankets are given to illustrate the difficulties of the consumer in selecting blankets with the scanty information at present given on labels. In conclusion the items which should be included in an ideal label for a blanket are given.

The influence of position isomerism (structural differences) in azo dyes on their fastness to light and washing, M. E. GRIFFITH (*Ohio Sta. Bul. 548* (*1935*), *pp. 80, 81*).—This progress report summarizes the results obtained in washing and light-exposure tests of samples of white wool cashmere dyed with the 37 azo dyes noted in the previous report (E. S. R., 71, p. 430).

The cleaning of weighted silk fabrics, J. E. ROSS and R. EDGAR (*Jour. Home Econ.*, *27* (*1935*), *No. 2*, *pp. 106–110*, *fig. 1*).—In this investigation at the

Iowa Experiment Station plain woven silk fabrics of similar construction and containing, respectively, iron, lead, tin, tin-lead, and zinc weightings and no weighting were subjected to physical and chemical analyses, and after dry cleaning or laundering 33 times were again analyzed for weight, ash content, wet and dry breaking strength, and elongation at the breaking load.

The silks weighted in different ways varied greatly with respect to degrees in breaking strength after dry cleaning or laundering. The average losses in dry breaking strength after 33 dry cleanings and launderings, respectively, were iron weighted 40 and 32, lead weighted 12 and 35, tin weighted 52 and 19, tin-lead weighted 53 and 47, zinc weighted 18 and 32, and degummed 20 and 38 percent. Corresponding losses in wet breaking strength were iron weighted 40 and 33, lead weighted 51 and 43, tin weighted 56 and 26, tin-lead weighted 64 and 47, zinc weighted 21 and 18, and degummed 18 and 33 percent. In this connection it is noted that a loss of 50 percent in breaking strength is one measure of the failure of a fabric. The elasticity of the dry weighted silks was greatly lowered by dry cleaning.

A list of 20 references to the literature is appended.

Speedy and accurate weighing, K. HESS and D. READHIMER (*Jour. Home Econ., 27 (1935), No. 2, p. 111*).—*During the course of the study of absorption of* moisture by fabrics (E. S. R., 72, p. 732), the necessity of rapid weighing led to a comparison of the speed and accuracy of weighing with the Jolly balance and the chainomatic balance. The time required for a single weighing with the Jolly balance was only about one-third that of the chainomatic, and the weighings were as accurate within 2 percent.

HOME MANAGEMENT AND EQUIPMENT

Stretching the resources: Money management for farm families, M. E. FRAYSER (*South Carolina Sta., pp. [1]+8*).—This mimeographed publication presents practical suggestions, based upon the family expenditure records reported in Bulletin 299 (E. S. R., 72, p. 573).

Family financing of higher education, P. S. GREENE (*Maine Sta. Bul. 377 (1934), p. 407*).—This progress report discusses briefly information and help needed by parents in planning the financing of the higher education of their children.

Electrical cookery, M. M. MONROE (*Maine Sta. Bul. 377 (1934), pp. 407–409*).—This progress report (E. S. R., 71, p. 575) describes briefly the baking performance of small, inexpensive, noninsulated, low wattage electric ovens, and discusses conditions under which these may be used to greater advantage than the regular range oven.

The relative importance of various characteristics in utensils used on the electric range, E. H. ROBERTS (*Jour. Home Econ., 27 (1935), No. 3, pp. 174–176*).—This report from the Washington Experiment Station is summarized as follows:

"The relative effect of varied characteristics of cooking utensils has been studied, particularly with reference to the effect on the time required to boil water and on the thermal efficiency of the utensils on electric surface units. The characteristics which most markedly affected the time to boil were the amount of water, the wattage of the unit, the contact with the unit, the bottom finish, and the cover of the utensil. Those affecting the thermal efficiency most decidedly were the amount of water, the contact with unit, the use of a cover to the pan, and the diameter of the pan in relation to the diameter of the unit. Thus, many of the variable characteristics affording maximum speed and efficiency in the heating process are seen to be external to the pan itself."

Air conditioning for California homes, B. M. Woods and B. F. Raber (*California Sta. Bul. 589 (1935), pp. 45, figs. 12*).—Information is presented on air conditioning with particular reference to methods and cost.

The relative merit of different methods, applied under various conditions, is discussed. An attempt is made to supply the necessary background for understanding the types of equipment available, their principles of operation, and the degree of effectiveness to be expected under certain conditions.

A section on initial costs and estimated operating costs of various types of equipment is included as a general guide.

MISCELLANEOUS

Report on the agricultural experiment stations, 1934, J. T. Jardine, W. H. Beal, et al. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1934, pp. 120*).—This report is discussed editorially on page 433.

Agricultural research in Arizona: Forty-fifth Annual Report [of Arizona Station], 1934, P. S. Burgess (*Arizona Sta. Rpt. 1934, pp. 102, figs. 13*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue. Meteorological observations are also reported.

Report of the Fruit and Truck Experiment Station, Hammond, Louisiana, [1934], B. Szymoniak et al. (*Louisiana Sta., Fruit and Truck Sta. Rpt. [1934], pp. 16*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1933–1934, J. M. Jenkins et al. (*Louisiana Sta., Rice Sta. Bien. Rpt. 1933–34, pp. 34*).—The experimental work not otherwise referred to is for the most part noted elsewhere in this issue.

Summary report of progress [of Maine Station], 1934, F. Griffee (*Maine Sta. Bul. 377 (1934), pp. 323–426, figs. 19*).—This bulletin contains data noted for the most part elsewhere in this issue or previously, together with meteorological investigations.

[Michigan] Experiment Station Report [for the] biennium ended June 30, 1934, V. R. Gardner (*Michigan Sta. [Bien.] Rpt. 1933–34, pp. 60*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-seventh Annual Report of the [Michigan Station], 1934, V. R. Gardner et al. (*Michigan Sta. Rpt. 1934, pp. 167–240, figs. 5*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Agricultural research in New Hampshire: Annual report of the director of the New Hampshire Agricultural Experiment Station for the year 1934, J. C. Kendall et al. (*New Hampshire Sta. Bul. 284 (1935), pp. 31*).—The experimental work not previously noted is for the most part noted elsewhere in this issue.

Fifty-third Annual Report of [Ohio Station], 1934, C. G. Williams et al. (*Ohio Sta. Bul. 548 (1935), pp. 120, figs. 17*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue. Meteorological data for 1933 are also summarized by C. A. Patton (pp. 114–119) as for previous years.

Report of the Puerto Rico Agricultural Experiment Station, 1934, [T. B. McClelland] (*Puerto Rico Sta. Rpt. 1934, pp. [2]+24, figs. 10*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Florida Station.—The State appropriation for the Citrus Substation at Lake Alfred has been increased from $11,451 to $46,451. A 40-acre tract of land and $650 in cash have also been given by the Florida Agricultural Research Institute for the development of the citrus work.

Hawaii University and Station.—A two-story agricultural building has been erected on the university campus. This building is made of hollow concrete blocks, is 120 ft. long by 60 ft. wide, and cost $68,000. It will house the offices of the station and the extension division and offices and laboratories for agronomy, chemistry, plant pathology, and soils.

John M. Westgate, director of the station since 1915, has resigned to become professor of tropical agriculture in the university, leaving in September to make studies of this subject in the Oriental Tropics. He has been succeeded as director by Dr. O. C. Magistad, formerly chemist for the Hawaiian Pineapple Canners' Station. Dr. G. K. Parris has been appointed plant pathologist beginning September 1, and William Storey assistant in horticulture beginning July 1.

Idaho University and Station.—Two tracts of land have been purchased in the fruit region of southwestern Idaho at Parma, one of 11 acres for horticultural investigations and one of 5 acres for entomological investigations. The work in horticulture has been reorganized by the transfer to Parma of L. R. Tucker, assistant professor of horticulture and assistant horticulturist, and the addition to the staff of George W. Woodbury as associate professor of horticulture and assistant horticulturist in the station.

T. R. Warren, instructor in dairy husbandry and assistant dairy husbandman of the station, has resigned to become field representative of the American Jersey Cattle Club for the Western States, and has been succeeded by Alfred O. Shaw. George S. Schilling has resigned as associate bacteriologist and has been succeeded by Dr. Glen L. Dunlap.

Maryland University and Station.—Oscar Clayton Bruce, professor of soil technology and associate soil technologist in the station, and for the past 6 yr. in charge of the soil survey in Maryland, has been given indefinite leave of absence to become project manager of the newly established erosion control project of the U. S. D. A. Soil Conservation Service in Washington County, with headquarters at Hagerstown. In this capacity he will be directly in charge of a demonstration project which will cover approximately 28,000 acres. He will also serve as acting State coordinator of the Soil Conservation Service, with responsibility for establishing cooperative relationships with State agricultural agencies.

New Jersey Stations.—A new greenhouse has been built for the use of the plant physiology department in its studies to determine the role of minor elements in plant nutrition. Dr. Linwood L. Lee, research specialist in land utilization, has been granted a year's leave of absence to continue as regional director of the U. S. D. A. Soil Conservation Service. Leland Burkhart has been appointed associate biochemist in horticulture, succeeding Dr. G. T. Nightingale, resigned to accept a position in Hawaii.

EXPERIMENT STATION RECORD

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EDITORIAL

THE PASSING OF DOCTORS DORSET AND MARBUT

The summer of 1935 brought to a close the careers of two eminent leaders of scientific research in the Federal Department of Agriculture. One of these was Dr. Marion Dorset, associated with its work for over forty years and since 1904 Chief of the Biochemic Division of the Bureau of Animal Industry. The other was Dr. Curtis Fletcher Marbut, head of the Soil Survey since 1910. Both died in active service after a brief sickness, Dr. Dorset in Washington, D. C., on July 14 and Dr. Marbut in Harbin, Manchuria, on August 25.

Doctors Dorset and Marbut were products of the land-grant institutions, though neither specialized along agricultural lines. Dr. Dorset, born in Columbia, Tennessee, on December 14, 1872, was graduated from the University of Tennessee in 1893 and subsequently attended the medical departments of the University of Pennsylvania and Columbian University, receiving the M. D. degree from the latter in 1896. Dr. Marbut was born in Lawrence County, Missouri, on July 19, 1863, grew up on a farm in the Ozark hills, made the most of such educational advantages as were available, and was graduated from the University of Missouri in 1889. In 1894 he received the Master's degree from Harvard University.

The long professional career of Dr. Dorset was spent entirely in the service of the Federal Department of Agriculture. His research covered a broad field, with many applications in the livestock, meat, and dairy industries and in public health. In the words of a tribute in *Science* by Dr. John R. Mohler, Chief of the Bureau of Animal Industry, he "was known especially for his investigations of hog cholera, during which he discovered an effective preventive-serum treatment now widely used, [presenting the patent obtained for this treatment to the Government for public utilization without payment of royalty]. Other discoveries included research on the biochemistry of the tubercle bacillus, keeping qualities of meats, the development and testing of dips and disinfectants, and extensive related work.

Dr. Dorset is credited with being one of the first scientists to make chemical analyses of the tubercle bacillus. He also introduced, in April 1934, a new tuberculin now used in official tuberculosis-eradication work conducted by the U. S. Department of Agriculture and cooperating States. His production of an effective and harmless fluid for marking Federally inspected meats has saved the United States Government millions of dollars because of the greater economy of this method over the former practice of using tags."

Dr. Dorset was also widely known for his leadership and his generous recognition of the work of others. As Chief of the Biochemic Division he proposed and sponsored many important investigations carried out by his coworkers. One of these studies resulted in a rapid method of detecting pullorum disease—a discovery now widely used and of great benefit to the poultry industry. He organized and supervised, from 1913 to 1917, the system of Federal inspection in establishments licensed by the Department to manufacture serums, viruses, toxins and related veterinary biological products and formulated the laboratory procedures in the administration of the Federal Meat-Inspection Act. He also served as the first chairman of the Insecticide and Fungicide Board. In recognition of these and other achievements, he received the honorary degree of doctor of science from the Iowa State College in 1915.

The early services of Dr. Marbut were in the field of geology. In 1890 he became a member of the State Geological Survey of Missouri. From 1895 to 1897 he was instructor of geology in the University of Missouri, assistant professor from 1897 to 1899, and professor from 1899 to 1910. In 1905 he also became director of the soil survey of the State, and five years later assumed active charge of the entire Federal project. During the quarter-century which followed, the area covered by detailed and reconnaissance surveys increased from about 200 million acres to approximately one billion acres, or substantially half of the entire land area of this country.

The detailed descriptions and maps of the widely distributed and diversified areas which have been surveyed have been further supplemented by a single comprehensive volume, The Soils of the United States, recently completed by Dr. Marbut. This volume, an epitome of the soil resources of the Nation, is being published by the Department as Part III of the Atlas of American Agriculture.

Dr. Marbut's knowledge and interests, however, were by no means restricted by the boundaries of the United States. He consistently visualized the study of soils as an international problem, and had become recognized as one of the world's principal authorities in the field of pedology. He rendered an especially conspicuous and valuable service in defining the fundamental and universal processes of soil formation and in outlining the scope and purpose of soil science

as a definite field of scientific research. He had studied in person the soils of Canada, Mexico, Central and South America, and most of Europe, had directed a classification of the soils of Africa, and at the time of his death was on his way to undertake an examination of the soils of China at the request of the Chinese Government.

His acquaintance and association with soil workers was equally cosmopolitan and inclusive. An outstanding figure in the First International Congress of Soil Science, held in this country in 1927, he had participated in practically all international undertakings for the promotion of soil classification, notably as head of the International Commission on genesis, classification, morphology, and mapping of soils. His final public appearance was as president of this Commission at the Third International Congress of Soil Science at Oxford, England, last July.

Many honors came to Dr. Marbut in addition to those already mentioned, including the LL. D. degree in 1916 from his Alma Mater and a subsequent appointment there as honorary professor of soils, the presidency of the Association of American Geographers in 1924, and the chairmanship of Section O (Agriculture) of the American Association for the Advancement of Science in 1926. He was closely identified with the American Soil Survey Association, and in 1928 he was made a fellow of the American Society of Agronomy.

Rutgers University conferred upon Dr. Marbut the D. Sc. degree in 1930, at the celebration of the fiftieth anniversary of the New Jersey State Experiment Station, as "an international authority on soil geography." In the same year he received the Cullum Medal of the American Geographical Society, awarded to such delvers into the unknown as Peary, Nansen, Scott, and Shackleton, for "his geographic work on the soil, 'the foothold of all things.'" This recognition of his kinship with the great explorers of the past was especially fitting, for he was characteristically inspired to the end by the spirit of discovery which is the basis of science. The world was much the richer for his indefatigable, clear-sighted, and consistent devotion to that ideal.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical and bacteriological investigations of the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 21–23, 29, 30, 59*).—Data are reported on the influence of bile and bile salts on *Bacterium aerogenes*, by J. E. Fuller; the bacteriostatic action of dyes with Gram-positive cocci, by Fuller and M. Rogosa; the indol tolerance of the *coli-aerogenes* group of bacteria, a study of the Voges-Proskauer test, and a comparative study of brilliant green bile broth and Dominick-Lauter broth with the standard lactose broth in testing raw waters, all by R. L. France; a method for the determination of quinic acid in cranberries and analyses showing the quinic acid content of leading varieties, by F. W. Morse; and methods for cider making and preservation, by C. R. Fellers, J. A. Clague, and P. D. Isham.

The basic amino acids of serum proteins, [I]–III (*Jour. Biol. Chem., 103 (1933), No. 1, pp. 261–267; 104 (1934), No 2, pp. 343–346; 347–350*).—In the work described by R. J. Block in the first of these three contributions, fresh cattle serum was fractionated by various concentrations of ammonium sulfate, sodium sulfate, magnesium sulfate, and sodium chloride. The various protein fractions as isolated by this procedure did not have the same chemical composition but differed in their content of the amino acids arginine, histidine, and lysine. It appeared that the more soluble serum proteins yielded the greater amounts of lysine on acid hydrolysis. The results were consistent with the hypothesis that the serum proteins are constructed of a large number of nondissociable components. "The proteins obtained by the usual physicochemical methods are not of a constant amino acid composition."

II. *The effect of heating to fifty-eight degrees*, R. J. Block.—This paper reports the observation that if cattle serum is heated at 58° C. for 3 hr., the amount and the basic amino acid composition of the protein fraction precipitated by half saturation with ammonium sulfate are the same as are obtained from unheated serum.

"The fractionation of cattle serum with half-saturated ammonium sulfate supports our previous conclusion, that is, the albumins or more soluble fractions yield the greater amounts of lysine on acid hydrolysis, and the proteins obtained from blood serum are artificial products produced by the reagents employed in their preparation."

III. *A chemical relationship between serum proteins of various origins*, R. J. Block, D. C. Darrow, and M. K. Cary.—This paper presents the conclusions, among others, that "although the amount of total protein in various samples of blood serum may vary 100 percent, its basic amino acid composition is constant. In spite of the fact that our previous investigations have shown that the more soluble (albumin) fractions of the serum protein always contain the higher amounts of lysine, nevertheless even with tenfold variations in the amount of albumin, the basic amino acid yield of the total serum protein remains the

same. . . . The basic amino acids yielded by acid hydrolysis of three kinds of mammalian serum proteins are constant both in absolute and relative amounts. Thus we have another instance of a tissue protein which, like the keratins [E. S. R., 67, p. 9], may be classified according to the molecular ratios of the basic amino acids it yields on acid hydrolysis.

"These observations should throw doubt on the idea that living serum contains two proteins or two groups of proteins which are usually classified as albumins and globulins. They support our previous suggestion that the proteins obtained from blood serum by the usual physicochemical methods are not of a constant amino acid composition, but are artificial products produced by the reagents employed in their preparation."

Some analyses of azoproteins—casein, gelatin, and zein coupled with arsanilic acid, W. C. Boyd and S. B. Hooker (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 329–337*).—The authors prepared a series of compounds of the three proteins casein, gelatin, and zein by successive treatments with diazotized arsanilic acid, and determined their arsenic and nitrogen content. They then compared the values obtained with those expected on the basis of Pauly's hypothesis that diazonium compounds couple with only the tyrosyl and histidyl groups of proteins. "The results, while of the right general order of magnitude, are all too high, but it is not yet obvious whether this is evidence against the hypothesis." Formulas for calculating the number of azo groups introduced are given.

The specific gravity of synthetic solutions of serum albumin and serum globulin, R. L. Nugent and L. W. Towle (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 395–398, fig. 1*).—It is the general conclusion of the authors of this contribution from the University of Arizona that, under the experimental conditions described, beef serum albumin and serum globulin exert effects upon the specific gravities of their synthetic solutions which are identical, within the limits of experimental error, with the methods usually employed for the accurate determination of specific gravity values.

The preparation of a crystalline globulin from the albumin fraction of cow's milk, A. H. Palmer (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 359–372, figs. 4*).—A method whereby 60 percent of the protein in the albumin fraction of cow's milk may be separated in a crystalline form by dialysis under controlled conditions is described.

"Since the protein is insoluble in salt-free water within the pH range 4.5 to 5.5, it should be classed as a globulin rather than an albumin. It is probable that a small amount of true albumin does exist in milk."

A few quantitative observations of the solubility of the new protein in solutions of low and high salt concentrations are reported.

The basic amino acids of keratins: The basic amino acid content of human finger nails and cattle horn, R. J. Block (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 339–341*).—This contribution reports the determination of the amino acids arginine, histidine, and lysine in human finger nails and in cattle horn by the method of Vickery and Block (E. S. R., 67, p. 9). The results indicate that these tissues have a chemical composition that resembles that of keratinoid tissues previously analyzed by Block and Vickery (E. S. R., 67, p. 9).

The method for the determination of the basic amino acids was modified in several minor details.

The solubility and preparation of phosphorus- and nitrogen-free glycogen, M. Somogyi (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 245–253, figs. 5*).—The solubility of glycogen in water-alcohol mixtures was studied with a view to finding the lowest alcohol concentrations applicable in the preparation and

purification of glycogen. These experiments furnished the foundation for a procedure by which nitrogen- and phosphorus-free glycogen was obtained.

Note on bombicysterol, W. Bergmann (*Jour. Biol. Chem., 107 (1934), No. 2, pp. 527–532*).—The unsaponifiable fraction of the chrysalis oil of *Bombyx mori* was found to amount to about 1.5 to 1.6 percent of the oil and to contain, besides large amounts of hydrocarbons, 33 percent of sterols. The sterols isolated consisted of a mixture of about 85 percent cholesterol and 15 percent sitosterols. The presence of bombicysterol could not be detected.

A contribution to the chemistry of Lactobacillus acidophilus.—II, Composition of the neutral fat, J. A. Crowder and R. J. Anderson (*Jour. Biol Chem., 104 (1934), No. 2, pp. 399–406*).—Having dealt, in an earlier paper (E. S. R., 69, p. 167), with the free, optically active, dihydroxystearic acid isolated by them from the fat extracted from the organism in question, the authors have now made a general analysis of the neutral fat and report the following observations:

L. acidophilus contains about 7 percent of ether-soluble lipides. The crude lipides are composed approximately of 28 percent of free fatty acids of which 3.4 percent is dihydroxystearic acid, 35.2 percent of neutral glycerides, and 32 percent of phosphatide. On saponification the neutral fat gave 6.7 percent of unsaponifiable matter, 81.5 percent of fatty acids, and 12.5 percent of crude glycerol. The crystalline portion of the unsaponifiable matter was identified as cholesterol.

The fatty acids consisted of 57.8 percent of solid saturated acids and 36.9 percent of unsaturated acids. The saturated fatty acids consisted of lauric, myristic, palmitic, and stearic acids. The unsaturated acid fraction yielded only stearic acid on catalytic reduction, and it is most probable that the unsaturated acid was oleic acid. A small amount of a liquid saturated fatty acid was present in the unsaturated acid fraction but could not be identified.

Fermentation as a factor in producing organic acids for chemical industry, H. T. Herrick and O. E. May (*Chem. and Metall. Engin., 42 (1935), No. 3, pp. 142, 143, fig. 1*).—The authors of a contribution from the Bureau of Chemistry and Soils, U. S. D. A., briefly summarize the biochemical and direct chemical methods available for the commercial production of organic acids, including citric, tartaric, acetic, lactic, gluconic, formic, malic, fumaric, oxalic, succinic, butyric, propionic, and gallic acids.

Enzymes of wheat flour as related to flour grade and baking characteristics (*Nebraska Sta. Rpt. [1934] p. 24*).—Variations in catalase activity in flours of different origin are briefly noted.

The chemical nature of rennin, H. Tauber and I. S. Kleiner (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 259–266*).—Rennin was rapidly and completely digested by pepsin and trypsin but not by erepsin. In mixtures of rennin and pepsin the latter could easily be separated from the former by this method. These findings support the hypothesis of the protein nature of rennin and indicate that rennin and pepsin are distinct entities. Absorption experiments with rennin on crystalline edestin indicate no exchange of the carrier in the case of rennin.

"The above facts are strong evidence against the carrier theory."

Studies on trypsin.—I, The chemical nature of trypsin. II, The effect of trypsin on casein, I. S. Kleiner and H. Tauber (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 267–270; 271–274*).—In the first of these two papers the authors report the preparation of a form of trypsin believed to be protein free. From the experiments described in the second paper it is concluded that trypsin can clot milk only within a certain limited range of concentration. If too con-

centrated or too dilute no clotting will occur. "If, however, the milk is so acid that the proteolytic activity of the trypsin is depressed, clotting may occur; otherwise trypsin changes the casein molecule very rapidly beyond the paracasein stage and the casein will not clot even after subsequent addition of a very active rennin solution. That the milk-coagulating power is a function of the trypsin molecule can be clearly seen from these experiments. The velocity of milk coagulation is proportional to the H-ion concentration of the milk in the cases of rennin, pepsin, or trypsin."

A contribution to the chemistry of tomato pigments: The coloring matter in American red and purple tomatoes (Lycopersicum esculentum), M. B. MATLACK and C. E. SANDO (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 407–414, figs. 4*).—It is reported in this contribution from the Bureau of Chemistry and Soils, U. S. D. A., that "the characteristic red coloring matter in American red and purple tomatoes has been isolated and studied. The pigment obtained from the American-grown varieties Indiana Baltimore, Santa Clara Canner, and Cooper Special was found to be identical with lycopene isolated from an Italian variety known as Fiaschetti."

The chemical determination of vitamin C with removal of interfering reducing and coloured substances, A. EMMERIE and M. VAN EEKELEN (*Biochem. Jour., 28 (1934), No. 4, pp. 1153, 1154*).—Cystine and other reducing substances and coloring matter which interfere with the titration, in acid solution, of ascorbic acid with 2,6-dichlorophenolindophenol may be removed by precipitation with mercuric acetate. Definite quantities of pure ascorbic acid added to blood were completely recovered by this method. It can be used with urine, milk, and tissue and plant extracts. Details of the experimental procedure are given.

Prune as an oxidation-reduction indicator: Its suitability for titration of ascorbic acid, J. MELVILLE and G. M. RICHARDSON (*Biochem. Jour., 28 (1934), No. 4, pp. 1565–1574, fig. 1*).—Objections have been raised to the use of 2,6-dichlorophenolindophenol for oxidative titration of ascorbic acid because of its instability in acid solution, indefinite oxidation potencial, faint pink end point, and lack of specificity. The oxazine dye "prune" was selected for this study because it seemed likely to be an indicator which would offer greater specificity for a weakly reducing substance such as ascorbic acid, and its potential range more nearly equaled that of this acid.

The results of elaborate potentiometric titrations with this dye showed that it is a valuable indicator over the pH range 2–7, but has slight advantage over 2,6-dichlorophenolindophenol for titrating ascorbic acid, since it cannot be weakened enough to eliminate other reducing agents which may be present in biological fluids. Its specificity, however, is slightly greater. The results furnish further proof that direct oxidative titrations of ascorbic acid are reliable only when other reducing substances are absent or far out of range.

New methods for the determination of the availability of nitrogen and phosphorus to plants, E. M. EMMERT (*Jour. Amer. Soc. Agron., 27 (1935), No. 1, pp. 1–7*).—The author proposes to substitute a determination of "soluble nitrogen" for that of nitrate nitrogen alone, because of the recognized fact that "other nitrogen compounds than nitrate may be absorbed and used by plants." Soluble nitrogen is described as that "soluble in 2 percent acetic acid", but it is determined by extracting from 1 to 5 g of the mature conducting tissue with 10 cc of 2 percent acetic acid in the presence of "a few tenths of a gram" of acid-extracted charcoal. Oxidation of the extract was effected by treatment with sodium chlorate and sulfuric acid, the excess chlorine was boiled out, and the nitrate content was then estimated colorimetrically by means of the phenoldisulfonic acid test.

A varying degree of correlation between the nitrogen and phosphorus contents of the conducting tissue and the yields of the crop plants was shown in the cases of tomatoes, lettuce, and cucumbers.

Apparatus for the determination of CO_2 in culture solutions, L. B. Arrington, C. H. Wadleigh, and J. W. Shive (*Soil Sci., 39 (1935), No. 6, pp. 437–441, fig. 1*).—The principles, construction, and operation of an apparatus in which the small carbon dioxide content of samples of culture solutions may be released by contact with strong acid, aerated into standard barium hydroxide solution, and determined by the titration of the excess of the alkaline solution without opening the apparatus during the determination or in any way exposing the sample or reagents to air containing any carbon dioxide are described in a contribution from the New Jersey Experiment Stations. Figures illustrative of the close agreement of the results obtained with the calculated carbon dioxide content of samples of known composition are given.

The isolation and detection of bilirubin, C. E. May, R. Martindale, and W. F. Boyd (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 255–257*).—Bilirubin was found best precipitated from a dilute aqueous solution by means of barium chloride and disodium phosphate or barium chloride and trisodium phosphate.

In neutral alcoholic solution, bilirubin reacted with *p*-sulfobenzene diazochloride to give a highly colored product. In an alkaline alcoholic solution of bilirubin, both *p*-sulfobenzene diazochloride and *p*-nitrobenzene diazochloride reacted. In an acetic acid solution of bilirubin, *p*-nitrobenzene diazochloride yielded a highly colored product. The colors produced were pronounced and were found to be stable for days. Biliverdin showed no tendency to react with diazochlorides.

Glyoxalase.—I, The applicability of the manometric method to the study of glyoxalase, M. E. Platt and E. F. Schroeder (*Jour. Biol. Chem., 104 (1934), No. 2, pp. 281–297, figs. 4*).—These experiments indicated that with acetone-yeast as the source of enzyme the manometric method is suitable for the accurate determination of glyoxalase activity.

At 25° C., and in the case of low glutathione and methylglyoxal concentrations, the rate of the enzyme reaction was independent of the methylglyoxal concentration and remained constant until all the methylglyoxal had been converted into lactic acid. Under these conditions, the rate was directly proportional to the amount of enzyme present. With high glutathione concentrations, the rate was dependent on the methylglyoxal concentration and was no longer directly proportional to the amount of enzyme. In pure solution methylglyoxal reacted very rapidly with glutathione, the reaction apparently reaching an equilibrium. Evidence in support of the hypothesis that the complex thus formed is the true enzyme substrate is presented. It was shown that iodoacetic acid inhibits acetone-yeast glyoxalase by destroying the glutathione, the enzyme itself not being harmed.

Aërobacter aërogenes as a cause of ropiness in maple sirup, F. W. Fabian and H. H. Buskirk (*Indus. and Engin. Chem., 27 (1935), No. 3, pp. 349, 350; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 4, p. 239*).—Bacteria isolated at the Michigan Experiment Station from the sap of *Acer saccharum* when inoculated into sterile sap or into dilute maple sirup produced a ropy maple sirup upon concentration of the sap to the consistency of sirup. Since these bacteria were isolated from the sap from which the ropy maple sirup was produced in the sugar bush, they were considered responsible for the condition. The morphological, physiological, and cultural characteristics of the bacteria thus shown to be responsible for this condition corresponded in all essential details to those of *Aerobacter aerogenes*.

The addition of acetic acid sufficient to cause approximately the acidity found in the fermented sap did not influence the consistency of the evaporated sap. The addition of a similar quantity of lactic acid did influence the consistency of the sirup. Neutralizing the acidity of fermented sap somewhat reduced the ropy condition of the concentrated sap.

AGRICULTURAL METEOROLOGY

Uniform terms in local and microclimatic investigations [trans. title], R. Geiger and W. Schmidt (*Bioklim. Beibl. Met. Ztschr.*, *1* (*1934*), *No. 4*, *pp. 153–156*).—An attempt is made in this article to indicate more uniform terminology and definitions for use in various lines of local and microclimatic investigations.

Is the "growing season" a significant climatological element, H. Landsberg (*Bul. Amer. Met. Soc.*, *16* (*1935*), *No. 6–7*, *pp. 169*, *170*).—The author concludes from studies of this subject that the growing season as commonly defined not only "has no important climatological significance" but "is misleading and apt to do more harm than good if used for practical purpose." Recognizing the agricultural value of climatological data, he states that "such data must include our knowledge of 'small-scale climate' (microclimate), with all its physically differentiated properties. If anything like 'growing season' is to be used, it has to be stated as the growing season for one particular plant. We shall have to investigate which climatic elements influence the particular plant; only those elements should be correlated which have a proper physical definition and are not indeterminable or accessory events, such as frost."

Agricultural meteorology: Studies in micro-climatology, II, L. A. Ramdas, R. J. Kalamkar, and K. M. Gadre (*Indian Jour. Agr. Sci.*, *5* (*1935*), *No. 1*, *pp. 1–11*).—Continuing investigations previously noted (E. S. R., 72, p. 12), further study was made of the modifying influence of different crops—rabi jowar, sugarcane, and wheat—on temperature, pressure of water vapor, and humidity near the ground in growing crops. "These results suggest that temperature and humidity inside crops are not related in a simple manner to those in the 'open', and that it may be necessary to measure them directly if one desires to study the actual climatic conditions inside the crops."

Studies on the ecology of coffee plantations in East Africa.—I, The climate and eco-climates of coffee plantations, T. W. Kirkpatrick (*London: Crown Agents for Colonies*, *1935*, *pp. 66*, *figs. 34*).—This paper gives an account of a preliminary investigation of climatic conditions in *Coffea arabica* plantations in East Africa, with particular reference to their relation to insect population. It deals in an introductory chapter with climate and agriculture; climate in relation to insect populations; weather, climate, and eco-climate; the meteorological elements; and other general matters. It discusses more in detail the relation between the standard climate, as determined by ordinary meteorological methods, and the climatic and eco-climatic conditions in a coffee plantation; and various factors which modify the climate of a coffee plantation. It is stated that it is the purpose to deal in subsequent communications "with the influence of different eco-climates on the insect populations of coffee plantations, with particular reference to species of economic importance; [and] with the extent to which the numbers of a species can be regulated by deliberate modification of the eco-climate of its habitat."

Climatic and physical observations on the action of drought on plant production [trans. title], J. Servy (*Ann. Agron.* [*Paris*], *n. ser.*, *5* (*1935*), *No. 3*, *pp. 449–465*, *figs. 2*).—This article deals with amount and distribution by years and seasons of rainfall in the region of Versailles, France, and with the

characterization and distribution of drought in this region, and reports comparative studies of certain so-called indices $R=\Sigma P/\Sigma E$, in which P represents rainfall and E evaporation.

Climatological data for the United States by sections, [1934] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 21 (1934), No. 13, pp. [245], pls. 2, figs. 26*).—Summaries are given of climatological data for each month of 1934 and for the year as a whole for each State.

Climatological data for the United States by sections, [November–December, 1934] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 21 (1934), Nos. 11, pp. [200], pls. 3, figs. 3; 12, pp. [204], pls. 3, figs. 3*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

SOILS—FERTILIZERS

[Soil and fertilizer researches of the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 12, 13, 14, 15, 21, 28, 29, 30*).—Work is reported on distribution of nitrogen in soils mixed with different plant tissues and allowed to react for 6 mo., by W. S. Eisenmenger and W. J. Moore; magnesium requirement of crops, by A. B. Beaumont and M. E. Snell; a study of base-exchange power and base content of typical Connecticut Valley soils as influenced by heavy liming and fertilization, by J. L. Haddock and H. H. Coyle, Jr.; experiments on the absorption by food plants of chemical elements of importance in human nutrition (potassium iodide, ferrous and ferric sulfates, and copper sulfate), by Beaumont and E. B. Holland; and studies of the *Azotobacter* soil plaque test for determining soil nutrient deficiences and of the calcium metabolism of nitrogen-fixing bacteria, both by J. E. Fuller, and of nitrogen fixation in the presence of or as a result of the growth of legumes v. nonlegumes under certain defined agronomic conditions and of the availability of soil potash with the object of developing a system of diagnosis for the soils of the State, both by F. W. Morse.

[Soil research by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1934], pp. 57, 71, 72, 80–83, 85, 86*).—Notes are given on soil acidity and liming, magnesium deficiency in soils, and the effect of crops on soil acidity. The report also contains articles on The Use of Seedling Plants to Determine Soil Nutrient Deficiencies, by B. E. Gilbert and F. R. Pember (pp. 80–83), and on The Use of the Hoffman Method for Determining Magnesium in Mixed Fertilizers, by J. B. Smith and W. L. Adams (pp. 85, 86).

Drainage and irrigation, soil, economic, and social conditions, Delta Area, Utah.—Div. 2, Soil conditions, D. S. Jennings and J. D. Peterson (*Utah Sta. Bul. 256 (1935), pp. 68, fig. 1*).—The virgin or noncultivated soils of the area in question were found to be largely of a fine texture (heavy draft), making cultivation and the production of a good tilth somewhat difficult. A determination of the friability index placed 3 clay types below 7 (extremely difficult to cultivate), 3 clay loams between 8 and 13 (relatively easy to cultivate), and 1 fine sandy loam above 25 (easily cultivated, but generally too loose).

Of alkali conditions it is noted that "although much of the Delta Area was served by drains during the period between 1919 and 1932, the data included in this publication indicate that there was no reduction of alkali concentration in a large portion of this drained area. In 1932 there were still many localities which contained concentrations higher than those given as the toxic limits for farm crops. Even in cultivated areas there had been no reduction in concentration for 5 soil types, while for 3 of the coarser textured soils (Woodrow clay loam, Oasis silty clay loam, and Oasis fine sandy loam)

there had been some slight improvement. Reasons for slow response to drainage apparently are: (1) High percentage of fine-textured soils, (2) high ratio of sodium to calcium in the soil alkali and irrigation water, resulting in a lower permeability to soil moisture, especially with the lower concentrations of alkali, and (3) upward moving waters which increase the alkali content of the upper soil layers. The alkali of the area is composed mainly of sodium chloride, sodium sulfate, and small amounts of bicarbonates."

A class-rating scheme is described, and the ratings of the soil types and type phases of the Delta Area are given.

The separation and identification of the mineral constituents of colloidal clays, M. DROSDOFF (*Soil Sci., 39 (1935), No. 6, pp. 463–478*).—Of some of the methods of which the relative value for the isolation of clay constituents was investigated in the experiments here reported from the Wisconsin Experiment Station, the following results are noted:

"Colloidal clays were subjected to steam pressure of about 200 atmospheres in a bomb for several days. The colloidal silica crystallized out as quartz, whereas the other constituents were unaffected. Prolonged electrodialysis and attempts to flocculate colloidal clay suspensions differentially proved unsuccessful as means for separating the clay constituents. A 2 percent solution of sodium carbonate at boiling temperature for several hours dissolves free silica from colloidal clays without affecting the base-exchange material. Prolonged treatment in the cold of colloidal clays (known to contain free iron oxides) with a solution of sodium acid oxalate (0.1 N with respect to sodium and hydrogen) removed the free iron oxides but also dissolved other constituents to some extent. No differential solubility of the constituents of colloidal clays in dilute HF was noted. Grinding clays in a ball mill, followed by extraction with ammonium acetate and other solvents, offers much promise as a means of separating some of the clay constituents. Preliminary experiments indicate that a magnesium silicate may be extracted from bentonite, while the exchange material is unaffected."

Further evidence of the existence of an iron silicate exchange compound, which is shown to be similar in composition and nature to the aluminum exchange compound, is presented. Colloidal clays fixed considerable amounts of potassium in a form not exchangeable and having no effect on the base-exchange capacity, indicating the presence of minerals other than the base-exchange compounds. Total analyses were made of some colloidal clays after the removal of free silica, alumina, and iron oxide, and stoichiometrical allocations of the constituents were made to fit the minerals thought likely to be present. In three cases out of four the data fitted the assumptions rather well, indicating the possible presence of talc, muscovite, and the exchange compounds having a SiO_2 to R_2O_3 ratio of 4:1.

Some chemical and physical properties of normal and solonetz soils and their relation to erosion, H. F. MURPHY and H. A. DANIEL (*Soil Sci., 39 (1935), No. 6, pp. 453–461*).—Data obtained in an investigation of the Oklahoma Experiment Station indicated a relatively high rate of erosion, especially after the loss of the A horizon, in certain solonetz soils.

The high erosion rate is considered to be due largely to a high dispersion coefficient, but "the high dispersion coefficient of the B horizon of the solonetz soils is not the only reason for their rapid erosion. Such areas are usually devoid of, or support only a sparse, vegetative growth, and hence there is no buffer against the agitation of raindrops, as there is on the normal soils where the vegetation may offer considerable protection not only in this manner but also because of extensive root development. This not only applies to the

solonetz soils where the B horizon is exposed but to those which have been under cultivation at some previous time and when only a thin A horizon remains. This thin A horizon is usually not capable of supporting a vegetative covering that will offer much protection to the soil, and, since rain water cannot penetrate the lower horizons, this thin horizon soon becomes supersaturated with water and erodes away rapidly when it occupies sloping areas. Although the clay content is usually somewhat higher, the high active sodium content and the low calcium-sodium ratio of the exposed B horizon of the solonetz profile readily account for the high dispersion coefficients of these eroded areas compared with the surface soil of the normal profile. . . .

"The replaceable sodium is high in the B horizon of the solonetz profile. It appears that where the replaceable sodium is high, even though there may be considerable water-soluble sodium, and the active calcium is such that the ratio of active sodium to active calcium is approximately 2 or less, the soils are unproductive. Such a condition also indicates a soil with a high dispersion coefficient, and, if it occupies an area of much slope, erosion will be quite severe."

Decomposition of the base-exchange compounds of soils by acids and its relation to the quantity of alumina and silica dissolved, G. S. Fraps and J. F. Fudge (*Jour. Amer. Soc. Agron.*, 27 (1935), No. 6, pp. 446–455).—According to a communication from the Texas Experiment Station, the coefficient of correlation between the total exchange capacities of 259 soils and the percentages of iron and aluminum oxides soluble in hydrochloric acid of 1.115 sp. gr. was +0.878±0.010. Digestion in boiling water for 10 hr. with 0.2, 1.0, 1.75, 3.50, 7.00, and 8.75 N hydrochloric acid reduced the average total exchange capacities of 12 soils 17, 47, 64, 74, 80, and 80 percent, respectively. When the alumina dissolved by the 7.0 N acid was placed at 80, the relative quantities of alumina dissolved were 10, 30, 58, 76, 84, and 80 percent. The correlation coefficient between the loss of exchange capacity and the quantity of alumina dissolved by the various strengths of acids was 0.859±0.029. The average decreases in milligram equivalent of total exchange capacity expressed as percentages of milligram equivalent of soluble alumina were 10.0, 9.2, 6.0, 5.4, 5.3, and 5.5. No relation between decrease in total exchange capacity and the ferric oxide dissolved was apparent.

The ratio of decrease in total exchange capacity to alumina dissolved varied in the cases of the various individual soils, especially with 0.2 N and 1.0 N hydrochloric acid. With the use of stronger acids, the relation between decreased total exchange capacity and soluble alumina was fairly constant. The quantity of alumina soluble in the various acids being expressed as milligram equivalent, the decrease in total exchange capacity was about 10 percent of the alumina dissolved with dilute acids but only 5.4 percent with the stronger acids. "This indicates a difference in the nature of the compounds of the exchange complex acted upon by the different strengths of acid." Digestion of the original soil and the residues from 1.0 N and 7.0 N hydrochloric acid with 0.5 N sodium hydroxide still further decreased the exchange capacity 1, 9, and 13 percent of the original capacity, or 0.3, 2.4, and 4.3 m. e., respectively. Silica in the sodium hydroxide extract amounted to 102, 528, and 1,123 m. e. "The relation between the silica dissolved and decrease in exchange capacity was very small."

The exchange capacities of two samples of bentonite digested with acid were decreased to a much smaller degree than were those of soils receiving similar acid treatment. Minerals other than bentonite appeared to be responsible for a considerable proportion of the exchange complex of soils. The exchange

capacities of a sample of dickite and two of kaolin were not affected by acid digestion.

"The results indicate the presence of a series of aluminosilicic acids in the exchange complex, varying in different soils with respect to strength, stability, and relative proportions."

Composition of black locust leaf mold and leaves and some observations on the effects of the black locust, A. F. Gustafson (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 237–239*).—The author of this contribution from Cornell University finds that a growth of black locust on an Illinois dune sand made possible a good stand of grass under the trees, whereas there was no growth of the grass on the same sand away from the trees. He gives analyses of the black locust leaf material, indicating its quantity as about 8,695 lb. per acre and its nitrogen content as more than 101 lb. per acre, and notes that "the growth of bluegrass in association with the black locust appears fully explained by the above data, the locust leaves supplying nitrogen and other nutrients, holding moisture, and probably helping to hold down the temperature of the sand during hot periods." The nitrogen of locust leaves was found to be 2.83 percent of the dried material, as against a corresponding figure of 2.34 percent for the first-cutting leaves of red clover in bloom.

The application of a modified procedure in nitrogen transformation studies in forest soils, H. A. Lunt (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 346–355, figs. 3*).—A contribution from the Connecticut [New Haven] Experiment Station records the following method:

"A steel sampling tube, 3 in. in diameter inside and 7 in. long, was constructed out of 3-in. pipe and equipped with an inside collar at the cutting end and a heavy outside collar at the opposite end. . . . The tube was pushed into the soil to its full length. Usually the upper portion of the forest soil profile is sufficiently loose so that nothing more than standing or treading on the cylinder is necessary to get it into the ground. Generally it is advisable to cut through the duff first with a hunting knife.

"The cylinder full of soil and duff was then dug out with a spade and the soil pushed out the top end by means of a plunger into a quart cardboard ice cream container of the same size and open at both ends. The sample was then transferred to a glass jar of the same size and shape. The purpose of the cardboard carton was to enable the operator to have the sample right side up in the glass jar.

"Closed with a glass top, the sample was then taken to the laboratory, weighed, and placed out of doors on a shaded bench and allowed to remain there 3 mo. By permitting the top to rest loosely on the jar, movement of air was ample, and no other means of ventilation was provided. Water was added about every 2 weeks, if necessary, to bring the samples up to weight. Usually from three to five samples were collected in each locality with one or more extra for immediate testing. The time of the original sampling coincided fairly closely with the initiation of biological activity in the spring, usually about May 1 in this climate.

"At the end of the incubation period the sample was slipped out into a pan, slit open lengthwise, and several portions tested for reaction and for ammonia and nitrate nitrogen by the spot plate method [recently developed at the Connecticut [New Haven] Experiment Station (E. S. R., 67, p. 105)]. In addition spot plate tests may be made for soluble calcium, magnesium, phosphorus, potassium, manganese, aluminum, and iron. Finally, as a check on the spot plate tests, a composite of all of the samples from one locality was analyzed quantitatively for ammonia and nitrate nitrogen. . . .

"Glass containers were the most satisfactory. Cardboard, whether paraffined or not, greatly interfered with the accumulation of soluble nitrogen and should not be used."

"In general, there is an inverse relation between ammonia accumulation and initial acidity and a direct relation between nitrate accumulation and initial acidity. The change in reaction during the incubation period was toward a lesser acidity where ammonification was greatest and toward a stronger acidity where nitrification was greatest. . . .

"The procedure followed has proved satisfactory, and the results obtained are believed to be more nearly in keeping with nitrogen changes in the natural forest soil than are those obtained under artificial optimum conditions."

It was shown that the mull types found in fast-growing hardwood stands nitrify to a considerable degree with the formation of only a relatively small amount of ammonia. The greatest ammonia accumulation occurred in the thick duff found in mature hemlock hardwood and mature white pine stands. Lime stimulated nitrification in the soil from a white pine plantation but had little effect in a red pine plantation. Soil from a locust stand nitrified to a marked degree and was in extreme contrast in this respect to that of a young red pine plantation adjoining. Growth of the red pine trees was found to be directly correlated with the nitrifying capacity of the soil. The beneficial effect of the locust stand upon nearby growth supported the observations of other workers, e. g., that of Gustafson at Cornell University (see p. 589).

Indigenous species of Rhizobium in the Arnot Forest, J. K. Wilson (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 231–236, fig. 1*).—In a contribution from Cornell University the author reports an investigation in which soil samples were collected from seven soil series in the Arnot Forest and were used as an inoculum for a medium in which leguminous plants were grown. The appearance of nodules was taken as the criterion of the presence in the soil of species of *Rhizobium*. It is concluded that the *Rhizobium* for black locust is indigenous in certain areas, that the *Rhizobium* for red clover is present in 2 of the 29 samples, and that the rhizobia for alfalfa and for vetch were not present in any of the soil series examined.

The numbers of Rhizobium meliloti and Rhizobium trifolii in soils as influenced by soil management practices, R. H. Walker and P. E. Brown (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 289–296*).—Determinations made on variously treated soils at the agronomy farm of the Iowa Experiment Station showed that in general the number of the root nodule bacteria *R. meliloti* and *R. trifolii* in soils depends upon the previous cropping history of the land, and also upon the fertilizer treatments made to the soil. Larger numbers of both species were found in the soil of 3-yr. rotation plats where mixed red clover and alfalfa were grown every third year than in the soil of 2-yr. rotation plats where legumes had not been grown for over 20 yr. Larger numbers of *R. meliloti* were also present in soil where alfalfa had been plowed up a month before sampling than where alfalfa had not been grown on the land for over a year. Applications of crop residues, manure, limestone, and rock phosphate each enabled the soil to support more alfalfa and red clover root nodule bacteria, the largest numbers of these organisms occurring in soils receiving combinations of these treatments. The condition of the soil with reference to organic matter, lime, and phosphate appeared to have a much larger influence on the numbers of these organisms in this soil than does the frequency of growth of the host plant. Recommendations for soil or seed inoculation evidently should be based upon both knowledge of the cropping

system to which the soil has been subjected and of the soil management practices followed.

Rates of absorption of ammonium and nitrate nitrogen from culture solutions by ten-day-old tomato seedlings at two pH levels, L. B. ARRINGTON and J. W. SHIVE (*Soil Sci., 39 (1935), No. 6, pp. 431–435*).—In contrast to the results of similar work at the same station on oats and on buckwheat (E. S. R., 69, pp. 500, 501), the authors of the present contribution from the New Jersey Experiment Stations found that in the case of tomato plants, "under optimum conditions, nitrate-nitrogen absorption rates generally predominated over ammonium absorption rates throughout the entire growth cycle. In this respect the facts indicate that the tomato plant may be regarded distinctly as a nitrate absorber when nitrogen is present in the growth medium in both the cation and anion forms simultaneously and in approximately equal molar proportions, but at no time in the active growth cycle has it been found that the tomato plant actually ceases to absorb cation nitrogen in the presence of an available supply of this form.

"Like other species previously studied, the tomato plant showed maximum absorption rates of cation nitrogen during the seedling phase of growth. These rates then rapidly declined with the age of the plant and seldom predominated over the anion absorption rates. Unlike other species previously studied, the tomato plant also showed maximum absorption rates of anion nitrogen during the seedling phase of growth, and these rates exhibited marked superiority over maximum rates of absorption of cation nitrogen."

Nitrogen, phosphorus, and potassium requirements of Indiana surface soils and subsoils, S. D. CONNER (*Jour. Amer. Soc. Agron., 27 (1935), No. 1, pp. 52–56, figs. 4*).—The results of an investigation carried out at the Indiana Experiment Station show that, in general, when Indiana subsoils are tested in pot cultures they exhibit a greater need than do the surface soils for phosphorus for both legumes and nonlegumes. "This need is often greater the further from the surface the soil is taken."

It was further observed that "nitrogen is more deficient for grain crops in subsoils than it is in surface soils. Subsoils did not show a deficiency of nitrogen when inoculated legumes were grown. When more than one crop was grown on the same subsoil, the first crop was relatively more in need of nitrogen and phosphorus than were the succeeding crops. Eroded surfaces and subsoils exposed in regrading operations or in fills using subsoil are in need of liberal phosphate and nitrogen fertilization when seeded down to nonlegumes. Legumes on such surfaces should be inoculated and heavily fertilized with phosphates. Lime is of course needed where the soil is acid. Potash may in some cases be needed on eroded surfaces, but, in general, Indiana subsoils are in no greater need of potash than are surface soils."

The availability of phosphorus in soils of alkaline reaction as related to usage of phosphate fertilizer (*Nebraska Sta. Rpt. [1934], pp. 13, 14*).—Results of work partly in cooperation with the U. S. Department of Agriculture are briefly noted.

The available phosphorus and potassium contents of surface soils and subsoils as shown by the Neubauer method and by chemical tests, S. F. THORNTON (*Jour. Amer. Soc. Agron., 27 (1935), No. 1, pp. 46–51*).—The author of this contribution from the Indiana Experiment Station gives comparative data for the surface and subsoils of 460 soils examined by means of the Neubauer method (E. S. R., 58, p. 319) and for 400 soils subjected to chemical tests.

"With the Neubauer method, subsoils as compared to surface soils show a much lower available phosphorus content. For soils from the Middle West, subsoils are phosphorus deficient in almost all cases. Neubauer values for available potassium are only slightly lower with subsoils than with corresponding surface soils. With chemical tests subsoils appear to be relatively only slightly lower in available phosphorus and slightly lower in available potash. With the Neubauer method there appears to be little correlation between pH and available phosphorus and potassium content. With chemical tests the phosphorus values increase with increasing pH, and the potassium values show somewhat the reverse tendency."

The data presented indicate that in the case of subsoils of the humid regions, at least, phosphorus deficiency is an important factor in the unproductivity so often observed.

The feeding power of plants for the potassium in feldspar, exchangeable form, and dilute solution, E. H. Tyner (*Soil Sci., 39 (1935), No. 6, pp. 405–422, pl. 1, figs. 3*).—For the purposes of an investigation carried out at the Wisconsin Experiment Station, the author devised a very simple flowing-culture apparatus having a number of desirable features. A diagram of the construction is given.

To ascertain the relative availability of the potassium content of microcline feldspar, the finely powdered mineral (180 mesh) was mixed with sand in a proportion equivalent to an application of 2 tons to the acre, and its effect was compared with that of potassium chloride added to a like sand culture at the rate of 100 lb. to the acre. The effect of the potassium content of an exchange complex was also studied.

It was found that "corn, rape, buckwheat, peas, sorghum, Sudan grass, soybeans, and oats were poor feeders on feldspathic potassium, whereas alfalfa, alsike clover, red clover, and sweetclover were relatively good feeders. The potassium content of the alfalfa, alsike clover, red clover, and sweetclover plants receiving feldspathic potassium was significantly increased over those not receiving potassium, whereas that of the poor feeders did not show this significant increase." "The feeding power of plants for the potassium of feldspars appears to be dependent on their ability to utilize more advantageously the potassium in dilute solution, which, in turn, may depend partly on the rate of plant growth."

"Flowing cultures showed that the minimum concentration of potassium necessary for good growth of buckwheat is close to 3 p. p. m., but that about 1 p. p. m. suffices for good growth of red clover."

"The potassium in inorganic and organic exchange form is very readily available. Its availability decreases with a decreasing degree of potassium saturation of the exchange materials. Plant roots, by secreting carbonic acid, can feed directly on exchangeable potassium.

"There is no significant difference in the rate of dialysis of potassium from the expressed sap of rape, sweetclover, buckwheat, alfalfa, corn, and soybeans; this indicates a similarity of form. The potassium in the macerated tissue of bluegrass and sweetclover is practically all in dialyzable form, and hence is in solution or in a state which readily hydrolyzes to a soluble form on dialysis. Consequently, the differences in feeding power are probably not related to any internal condition of the potassium."

Where do fertilizers go after they are applied? C. B. Sayre (*Farm Res. [New York State Sta.], 1 (1935), No. 4, pp. 2, 4*).—This is a brief popular discussion of the movement of fertilizer components in the soil. The high solubility of the nitrates and ammonium salts, the predominantly vertical movement

of all substances carried in the soil solution, the fixation of phosphates, the behavior of potassium salts commonly used as fertilizers, etc., are concisely described.

AGRICULTURAL BOTANY

Plant life: A textbook of botany, D. B. Swingle (*New York: D. Van Nostrand Co., 1935, pp. XIV+441, pl. 1, figs. 290*).—This book is designed to meet the needs of a one-semester elementary college course in general botany. The author has included a large number of excellent illustrations carefully selected from a wide range of sources.

An introduction to plant life, C. L. Wilson and J. M. Haber (*New York: Henry Holt & Co., 1935, pp. XIV+493, pl. 1, figs. 316*).—This is a well-illustrated textbook in general botany intended for a half-year course. The book is modern in its viewpoint, and there is considerable emphasis on the applied phases.

The plant kingdom: A textbook of general botany, W. H. Brown (*Boston and London: Ginn & Co., 1935, pp. IX+869, figs. 1,040*).—This large elementary textbook of botany is designed for a year's course in colleges. The author presents an abundance of examples of the different structures, phenomena, and groups of plants discussed. There is a great abundance of clear-cut illustrations, a large majority of which are original. Modern advances in botanical science are given due consideration.

Botany: Principles and problems, E. W. Sinnott (*New York and London: McGraw-Hill Book Co., 1935, 3. ed., pp. XIX+525, pl. 1, figs. 310*).—The third edition of this well-known introductory college textbook of botany, previously noted (E. S. R., 67, p. 20), although maintaining the original plan of organization has been revised in line with recent scientific advances. It introduces a chapter on morphogenesis (experimental morphology) and includes 76 new illustrations and about 70 new "Questions for Thought and Discussion."

A manual of southern California botany, P. A. Munz (*Claremont, Calif.: Claremont Cols., 1935, pp. XXXIX+642, figs. 310*).—This manual covers the vascular plants of the region extending from Point Conception, Santa Barbara County, through the Mohave Desert to the Death Valley region in Inyo County and southward to the Mexican border. A discussion of the distribution of southern California plants is given, which includes the geological history of the territory covered and the physiographic features. It also treats of life zones and climatology and of the affinities and endemism of the native flora. There is a general key to the families, with keys to the genera and species included under the descriptive flora. In this part each genus and species is described, and many are illustrated with clear line drawings. The author has adopted certain nomenclatorial changes, all of which are listed separately at the end of the book. A list of persons for whom species have been named is an unusual and interesting feature of the book. A section is devoted to the meanings of the species names. There is a glossary and an index.

[Plant physiology studies by the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 26, 27*).—Data are reported on the nontoxic effect of copper containers on barley plants, by L. H. Jones, and the absorption of nutrients by clay pots, by H. D. Haskins and Jones.

[Plant physiological studies in Rhode Island] (*Rhode Island Sta. Rpt. [1934], pp. 67, 68, 69–71, 73*).—Results are briefly reported on carbon dioxide assimilation of the leaves of apple, pear, and strawberry under the influence of various fungicides, of increased illumination, and of various rates of air flow; the effect of length of day on the growth and fluctuations in the storage of nitrate and sugars in beets grown in sand cultures at different nitrate levels;

the influence in the field of different nitrate levels and of the substitution of urea for nitrate of soda during early growth with celery; cylinder tests with carrots on the optimum soil nitrate levels at different periods of growth; and effects of a crop upon its successor.

The influence of light and temperature on the assimilation rate of seedling tomato plants, variety E. S. 1, B. D. Bolas (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 19 (1933), pp. 84–87, figs. 3*).—Experiments conducted with seedlings about 5 in. high exposed to light intensities ranging from 0 to 1,000 foot-candles under a range of temperatures from 45° to 90° F. disclosed the fact that for any particular light intensity there is one temperature and only one at which the photosynthetic activity of the plant is working most efficiently. In one set of tests the optimum temperatures for photosynthesis under light intensities of 100, 200, 600, and 1,000 foot-candles proved to be approximately 62°, 68°, 75°, and 90°, respectively. Temperatures above the optimum in each case resulted in a drop in carbohydrate accumulation.

The translocation of solutes in plants: A critical consideration of evidence bearing upon solute movement, O. F. Curtis (*New York and London: McGraw-Hill Book Co., 1935, pp. XIII+273, figs. 13*).—The author reviews and discusses the more important contributions dealing with the problem of the translocation of solutes in plants and includes some of the results from his own investigations. An effort is made to give a picture of the present outlook on the subject and to evaluate critically the methods of study that have been used.

There are seven chapters, dealing respectively with the significance of translocation and earlier opinions as to tissues involved, evidence for the upward transport of organic matter through the phloem, evidence for the upward transport of nitrogen and salts through the phloem, evidence indicating downward transport through the xylem, a comparison of criteria and methods used to determine the tissues of transport, the method of movement through the phloem, and possible relations between solute distribution and behavior. Each chapter concludes with a summary of the chief points covered. There is also a bibliography.

Studies on growth of sugar cane in nutrient solutions, J. P. Martin (*Hawaii. Planters' Rec., 39 (1935), No. 2, pp. 79–96, figs. 17*).—The results are recorded of some of the sand- and water-culture studies on sugarcane conducted over a 2-yr. period.

Although good growth was obtained with nutrient solutions when made up with distilled water, which gave a pH of from 5.0 to 5.2, poor growth was met with when tap water was used which gave a pH of from 5.8 to 6.0, due to the fact that the iron was rendered insoluble, resulting in chlorotic foliage and stubby, often diseased, root systems. When adjusted to from pH 5.0 to 5.2 with sulfuric acid, the solutions made up with tap water gave normal growth. When a solution was rendered more acid than pH 4.0, growth was definitely retarded and the plants were injured.

When manganese was omitted, typical symptoms of "Pahala blight" appeared. When manganese was added at the rate of 0.25, 10, 20, 40, and 80 p. p. m., apparent iron-deficiency symptoms and badly discolored roots developed in all but the lowest concentration. This gave normal top growth and vigorous roots. Aeration of the cultures resulted in superior top and root growth and in less root rot.

When two roots developing on one side of a cane in an iron-free solution were allowed to absorb from a flask nutrient to which 10 p. p. m. of iron had been added, the chlorotic foliage began to green up within 5 days. At the end of

14 days the half of each leaf on the side of the cane supplied with iron was of normal color, while the portion on the other side of the midrib remained in each case chlorotic.

GENETICS

Cytogenetic evolutionary processes in plants, R. A. Brink (*Amer. Nat.*, *69* (*1935*), *No. 721*, *pp. 97–124*).—Three general classes of cytogenic processes which have been the objects of considerable study and which appear to be of significance in evolution—amphidiploidy, changes in chromosome number not involving the whole genom, and structural changes in the chromosome—are discussed. The nature of evidence indicating that the processes have played a role in the differentiation of existing species is pointed out, and certain results which detailed experimental analysis of the phenomenon has afforded are reviewed.

Inheritance of seed color in alfalfa, R. M. MacVicar (*Sci. Agr.*, *15* (*1935*), *No. 5*, *pp. 314–328*, *figs. 2*).—Genetic studies involving white- and black-seeded plants found in Grimm alfalfa furnished evidence that the white-seeded parent was homozygous for a recessive factor which results in the absence of yellow pigment, and the inheritance of this character was comparatively simple. Inheritance of black-seeded character was fairly complex, requiring assumption of at least three factor pairs. The original black-seeded plant was thought to have arisen as a single gene mutation, the gene being primarily responsible for pigmentation of the seed coat. Expression of seed coat color seemed to be influenced somewhat by physiological factors conditioned by the environment. Black-seededness appeared to be valueless as a character for identifying an improved strain.

Gametophytic genes in a high waxy strain of maize, W. H. Eyster (*Amer. Nat.*, *69* (*1935*), *No. 720*, *pp. 62, 63*).—In certain pedigreed cultures at Bucknell University, corn plants heterozygous for waxy endosperm gave rise to F_2 kernel progenies in which the percentage of waxy kernels varied from 5 to 48, and to backcross progenies having from 39 to 90 percent of waxy kernels. In all cases the deficiency of starchy and excess of waxy kernels, or the reverse, were caused by genes affecting the microspores of male gametophytes but never by megaspores or female gametophytes. An extensive polymorphism in the pollen was revealed. Some of the genes which render the male gametophyte nonfunctional have their loci in chromosome 9 and are responsible for the observed deviations from the expected numbers of waxy and nonwaxy kernels.

Genetic behavior of a haplo-viable internal deficiency in maize, L. J. Stadler (*Amer. Nat.*, *69* (*1935*), *No. 720*, *pp. 80, 81*).—This deficiency, designated *Df* 5_1 and induced by X-ray treatment of mature pollen, involves a short internal segment of the longer arm of chromosome 5. Plants heterozygous for the deficiency are equal to nondeficient sibs in growth and are distinguishable only by the defective development of half of their pollen. The deficiency is not transmitted through the pollen but regularly through the female gametophyte. The deficiency includes the locus of the gene V_3, but not the neighboring loci of Bm_1, *Bt*, or *Bv*. Cytological peculiarities are noted.

A new aleurone color in maize, M. M. Rhoades (*Amer. Nat.*, *69* (*1935*), *No. 720*, *pp. 74, 75*).—A selfed ear of an inbred strain of Black Mexican sweet corn segregated for aleurone color at Cornell University into 12 purple : 3 dotted : 1 colorless seeds. The unexpected dotted aleurone class was caused by the interaction of a new dominant factor (*Dt*) with recessive a_1. Since Black Mexican strains are not known to carry *Dt* and are homozygous for aleurone color, it seemed probable that the mutations A_1 to a_1 and of *dt* to *Dt* occurred in the

same cell. *Dt* is specific in its interaction with a_1, since it produced no color with a_2, *c*, or *r*. It showed no linkage with a_2, a_3, *a*, *r*, and *ss*. Intensity of dotting also is discussed.

Linkage relations in the A–Rg group in maize, R. A. BRINK (*Amer. Nat., 69 (1935), No. 722, pp. 283–285*).—The linkage relations indicated were established at the Wisconsin Experiment Station for group 3 in corn. The order of the genes involved in each experiment and the amounts of crossing-over between successive marked loci were as follows: (1) a_1 23 *na* 36 ts_4 9 Rg_1; (2) a_1 36 lg_2 16 Rg_1; (3) a_1 39 ba_1 22 Rg_1; (4) lg_2 37 d_1; and (5) Rg_1 24 d_1.

Genetic relations of three genes for anther color in cotton, G. N. STROMAN (*Jour. Amer. Soc. Agron., 27 (1935), No. 3, pp. 208–215*).—Interrelations of three genes for anther color found in an apparently natural cross of an upland type of cotton, *Gossypium hirsutum*, with a Peruvian type, *G. barbadense*, are described from New Mexico Experiment Station studies. The data seemed to verify the hypothesis of two basic genes, *P* and *B*, for yellow and white anthers, with an additional gene, *I*, which when present inhibits either *P* or *B* when either is alone. The interrelations of these three genes were shown by the several ratios of yellow to white, namely, 42:22, 3:1, 9:7, 13:3, 15:1, 1:3, and 3:13.

Carbohydrate-nitrogen ratios with respect to the sexual expression of hemp, P. J. TALLEY (*Plant Physiol., 9 (1934), No. 4, pp. 731–748, figs. 2*).—Analyses of the aerial portions of staminate and pistillate plants of hemp were made at the Texas Agricultural and Mechanical College at the time they were coming into flower. Little if any difference in the percentages of moisture and dry matter was found to exist between the sexes of hemp. Staminate plants had higher average percentages of total carbohydrates, polysaccharides, and sugars, and a much greater abundance of reducing sugars than pistillate plants, whereas nitrogen was relatively more abundant in the latter. The carbohydrate-nitrogen ratios of the sexes are discussed with respect to differences in sexual expressions and growth habits of the plants.

Studies in interspecific crossing with Melilotus and in intergeneric crossing with Melilotus, Medicago, and Trigonella, T. M. STEVENSON and L. E. KIRK (*Sci. Agr., 15 (1935), No. 8, pp. 580–589; Fr. abs., p. 589*).—Interspecific hybrid plants, readily obtained by crossing *Melilotus alba* with Redfield Yellow sweetclover, were strong and vigorous, most being perfectly fertile and a few partially sterile. Marked variations in compatibility were observed between different varieties and individual plants of *M. alba* when crossed with Redfield Yellow. Crosses between varieties of *M. officinalis* and Redfield Yellow produced no viable seed, although in some cases shrunken seed with abortive embryos were obtained.

No viable seed was obtained from *M. alba* × *M. officinalis* crosses, but in most cases abortive embryos were formed showing that fertilization had taken place. Seed was not formed when alfalfa was pollinated by sweetclover, but abortive seeds were produced in a few cases from the reciprocal crosses. All crosses between sweetclover species or alfalfa and *T. coerulea* were fruitless except in the case of *M. alba* × *T. coerulea*, which produced normal seed greatly in excess of control flowers emasculated but not pollinated. Seeds with abortive embryos were produced by self-fertilized flowers of *Melilotus*, *Medicago*, and *Trigonella*.

Genetical studies of monosomic types of Nicotiana tabacum, H. P. OLMO (*Genetics, 20 (1935), No. 3, pp. 286–300, figs. 3*).—The seven monosomic (2n−1) types of *N. tabacum purpurea*, described from studies at the University of California, usually were characterized by reduced growth vigor, development

rate, and pollen fertility compared with normal *purpurea*, dimorphic pollen, and high transmission of the monosomic condition through the ovules ([illegible]–82.2 percent) and low through the pollen (0–7.3 percent). Indications were that univalent elimination may occur more often during megasporogenesis than microsporogenesis. No correlation was apparent between transmission of the monosomic condition through the eggs and pollen of the same haplotype.

Chromosome ring in X-rayed rice, K. Ramiah, N. Parthasarathi, and S. Ramanujam (*Assoc. Econ. Biol., Coimbatore, Proc., 2 (1934), pp. 1–4, pl. 1*).—Pollen meiosis was studied in a sterile rice plant derived from X-rayed seeds at the Coimbatore Paddy Breeding Station. At first division, diakinesis and metaphase, chromosomes instead of being associated in pairs forming the usual bivalents showed multivalent ring structures involving association of four chromosomes. The origin and significance of the ring structure are discussed.

A comparative study of certain morphological characters of sugarcane × sorgo hybrids, B. A. Bourne (*Jour. Agr. Res. [U. S.], 50 (1935), No. 6, pp. 539–552, pls. 4, figs. 4*).—Cross-pollination between sugarcane and sorgo was effected by the Florida Experiment Station by bagging the sugarcane tassels from late evening until about 10 a. m. each day throughout flowering, so as to exclude rain and dew and prevent reduction in osmotic pressure of the stigma fluid, and dusting sorgo pollen on the bagged tassels between 6 and 8 a. m. After the cross-pollination (about 10 days) was over the sugarcane tassels were allowed to ripen normally in the open, this taking about 4 weeks. About 3 percent of these hybrids showed vigor enough to warrant field trials.

Comparisons were made of the parents (P. O. J. 2725 sugarcane and Texas Seeded Ribbon and Early Orange sorgos) and sugarcane × sorgo hybrids as to leaf width, diameter of stem, plant height, type of inflorescense, and flower structure when grown under like conditions. Hybrids of P. O. J. 2725 × Texas Seeded Ribbon averaged intermediate between the parents in leaf width and stem diameter and significantly less in height. One hybrid, F. 31–18, showed an awned fertile lemma, 2 ovaries, and 3, 4, and even 5 styles and stigmas to the floret, flower structures not found in either parent. Study of 7 hybrids selected at random showed most of them to have intermediate anatomical characters of the stem epidermis, relative to average cell width and number of solitary silica cells but all had more short-cell groups per unit area than the sugarcane parent, even when the sorgo parent had fewer than the sugarcane crossed with it. Pointed, elongated stem epidermal cork cells were not abundant in any hybrid examined, being absent in both sorgos but very abundant in P. O. J. 2725 sugarcane.

Inheritance of stem-rust reaction in wheat, II, J. A. Clark and G. S. Smith (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 400–407*).—Three further crosses (3 strains of the H–44 × Ceres, classified in F_3 as near-immune, crossed with the susceptible Marquis) are interpreted as showing that the same major factors principally control the inheritance of the 3 stem-rust reactions—near-immunity, resistance, and susceptibility. No additional minor or modifying factors could be established directly from the results of these crosses. Certain variations and inconsistencies in the interpretation were considered about as likely due to variations caused by environment as to additional minor or modifying genetic factors. The present studies confirmed results from the earlier crosses (E. S. R., 70, p. 31).

A genetic analysis of the seed characters wrinkled, dimpled, and smooth in Pisum, J. W. Hadfield and R. A. Calder (*Jour. Agr. Sci. [England], 25 (1935), No. 2, pp. 264–277, pls. 2*).—Crossing experiments with garden peas having smooth, wrinkled, and intermediate or dimpled seeds indicated that smooth

character is dominant to wrinkled, dimpled epistatic to smooth, and wrinkled epistatic to the dimpled condition. Genetic formulas are suggested for the varieties with the three different surface characters.

Cytology and fruit breeding.—I, What is cytology? B. R. NEBEL (*Farm Res. [New York State Sta.], 1 (1935), No. 4, pp. 3, 4, fig. 1*).—In this, the first of a proposed series of articles dealing with the major subject, the author defines cytology and discusses the structure of the cell.

Characteristics of diploid and triploid apple varieties.—I, Measurements of stomata, B. R. NEBEL (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 254, 255*).—Measurements by the New York State Experiment Station of the foliar stomata of 12 triploid and 14 diploid varieties of apples collected during July 1934 showed a consistently greater length for the triploids. The averages were 74.14±0.75 and 62.79±0.72μ. Of 26 varieties, Tompkins King (triploid) had the longest stomata (79μ) and Cortland (presumably diploid) was the shortest (58.2μ).

Linkage relations of Zavadskaia shaker in the house mouse (Mus musculus), F. H. CLARK (*Natl. Acad. Sci. Proc., 21 (1935), No. 5, pp. 247–251*).—Results are presented on linkage tests between the Zavadskaia shaker factor in the house mouse and the pink-eye, chocolate, leaden, dwarf, hairless, rodless, and hydrocephalus factors. All are considered to have given negative results, with the possible exception of the indication of linkage between hydrocephalus and shaker.

The Zavadskaia shaker factor has been found to be genetically distinct from the ordinary shaker factor and from waltzing.

The characters located in 14 of the 20 chromosomes are indicated.

Multiple births in dairy cattle, L. W. LAMB (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 185–189, fig. 1*).—A brief summary of the occurrence of multiple births in dairy cattle, with reference to the birth of triplet bull calves by a Jersey cow in the herd of the Michigan State College.

Studies on the physiology of reproduction in the sheep, I, II, R. T. CLARK (*Anat. Rec., 60 (1934), No. 2, pp. 125–159, pls. 4, figs. 2*).—Two papers in this series from the Minnesota Experiment Station are reported:

I. *The ovulation rate of the ewe as affected by the plane of nutrition.*—A comparative study is reported of the number of corpora lutea observed in the ovaries of 2- and 3-year-old ewes after subjecting them to a period of flushing, during which the flushed groups in 1931–32 and 1932–33 made average daily gains of 0.23 and 0.21 lb., respectively, as compared with less than 0.04 lb. gain by the unflushed groups.

During the first year western ewes in a relatively thin condition were employed, and the numbers of corpora lutea observed averaged 1.4 in the flushed ewes and 1.0 in the unflushed group.

During the second year Shropshire ewes in a relatively high condition were employed. The numbers of corpora lutea in the flushed group averaged 1.5 and in the unflushed group 1.7.

It is pointed out that the condition of the ewes determined whether or not increased numbers of ova are likely to be produced as a result of flushing.

II. *The cleavage stages of the ovum.*—Data are reported on the ova of the sheep, slaughtered in the above experiment, at different stages of gestation ranging from 4½ to 138¾ hr. after mating. At the earliest stages the ova were unsegmented, but those recovered from the more advanced females were in the 32-cell stage. The first cell division was found to take place at about 38 to 39 hr. postcoitum, with the second and third cell divisions following very rapidly. By the end of the ninth day the trophoblast changed to a spherical vesicle dis-

tended with fluid. Implantation took place between the ninth and eleventh days. No cases of monozygotic twinning were observed.

On the control of reproductive activity in an annual-breeding mammal (Citellus tridecemlineatus), C. R. MOORE, G. F. SIMMONS, L. J. WELLS, M. ZALESKY, and W. O. NELSON (*Anat. Rec., 60 (1934), No. 3, pp. 279–289*).—Brief accounts are given of the condition of the reproductive organs and their response to gonadotropic substances in different seasons of the year in a 13-lined ground squirrel.

The response of the gonads and accessory reproductive organs of both sexes to the gonadotropic substances at any season of the year suggests a differential activity of the anterior pituitary as accounting for the differences between the annual breeding animals and those which breed throughout the year.

Influence of the uterus on ovary and mammary gland, H. SELYE (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 488–490, fig. 1*).—In a series of experiments it was found that recurrence of estrum and lactation, usually following caesarian operations in the rat, were prevented by distending the uterus with paraffin. When the uteri of lactating rats were filled with paraffin on the day of parturition, the dams failed to nurse their young in spite of active suckling. The mammary glands showed definite signs of involution.

Functional capacities of ovaries of new-born after transplantation into adult ovariotomized rats, C. A. PFEIFFER (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 479–481*).—Determination of the extent to which immature ovaries obtained from new-born rats were found to fulfill the endocrine functions of the adult ovary was made by grafting the immature ovaries into ovariectomized adult female rats. Following ovariectomy the estrous cycles immediately ceased, but reappeared after about 12 to 16 days. On autopsy it was found that apparently no ovulation had occurred, but the ovaries contained large cystic follicles. However, in only one case did the influence of the graft completely prevent the formation of castrate cells in the hypophysis.

Absence of effect of antuitrin-S injections on the immature ovary, S. H. GEIST (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 434, 435*).—Intramuscular and intravenous injections of 2,500 rat units of antuitrin S into infants of 10 and 18 mo. of age had no evident effect in the production of follicular maturation or luteinization in the ovary, as determined macroscopically and microscopically.

Morphological studies on the anterior pituitaries of mature female rats receiving injections of pregnancy urine extracts, J. M. WOLFE, E. T. ELLISON, and L. ROSENFELD (*Anat. Rec., 60 (1934), No. 3, pp. 357–371, pls. 2*).—In studies of the influence of the subcutaneous administration of from 25 to 75 rat units of pregnancy urine daily for 15 days, to 44 mature female rats, on the size of the ovaries and pituitaries and histological changes in the pituitary gland, it was found that the size of the ovaries was increased from 39 to 84 mg in 137 controls to 766 mg in 1 individual. The amount of pregnancy urine injected was immaterial within the limits employed. Increases in the weight of the pituitary glands were related to the increases in the weight of the ovaries.

Histological studies showed an extreme granular depletion of the basophiles and a less marked depletion of the eosinophiles. Colloid was found in the residual cleft of practically all the injected rats.

Loss of sensitivity to anterior pituitary-like hormone of pregnancy urine, H. SELYE, J. B. COLLIP, and D. L. THOMSON (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 487, 488*).—The ovaries of 12 rats, injected with the anterior pituitary-like hormone of pregnancy urine over a period of 4 mo.,

eventually became subnormal in size. When this treatment was followed by an anterior pituitary extract the size of the ovaries increased materially, indicating that although the ovaries had lost their sensitivity to the hormone of pregnancy they still responded to hypophysis extracts.

The absorption of estrogenic substances of pregnant urine administered orally to young rats, C. B. FREUDENBERGER and P. M. HOWARD (*Anat. Rec., 60 (1934), No. 3, pp. 267–272*).—The oral absorption of the estrogenic hormone from pregnancy urine, administered thrice daily in doses as small as 0.1 cc of a dilution of urine with water 1 to 15, was demonstrated. This dose caused the premature opening of the vagina of an ovariectomized rat at 27 days of age.

Chemical determination of pregnancy, J. P. VISSCHER and D. E. BOWMAN (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 4, pp. 460, 461*).—A chemical test of urine for diagnosing pregnancy was found to give an accuracy of 93 percent in 317 cases. In 40 cases in which Aschheim-Zondek tests were also made, there was agreement in only 33 of the cases. One irregular result was found to be due to a uterine fibroid growth.

A study of the seasonal changes in the adrenal gland of the thirteen-lined ground squirrel (Citellus tridecemlineatus), with particular reference to its sexual cycle, M. ZALESKY (*Anat. Rec., 60 (1934), No. 3, pp. 291–321, pls. 2, fig. 1*).—A detailed study of the relation of changes in the adrenal glands to the reproductive cycle in the 13-lined ground squirrel showed that a significant increase in adrenal size and weight, traceable to cortical hypertrophy, occurred in both males and females during the breeding season or following gonad stimulation with pregnancy urine, testis hormone, antuitrin S, or estrin during the inactive period.

Degenerative changes in the zona reticularis of the adrenal of either sex followed castration.

The development of the tunica dartos muscle in rams, R. W. PHILLIPS (*Massachusetts Sta. Bul. 315 (1935), p. 20*).—Data are reported on the development of the temperature-regulatory function of the scrotum through the tunica dartos muscle at 3-week intervals, from 3 to 27 weeks of age, and after castration.

Further studies on the influence of suckling, H. SELYE and T. McKEOWN (*Anat. Rec., 60 (1934), No. 3, pp. 323–332, figs. 7*).—The active period of lactation and the duration of the diestrous period were prolonged in lactating mice by lengthening the suckling period through replacement with additional young mice. When lactation ceases a peculiar type of involution of the mammary gland occurs, but the prolonged estrous periods continue. The suckling stimulus leads to prolongation of the estrous periods and development of the mammary gland in nonovariectomized mice. The suckling stimulus directly influences secretory activity even when the milk is not removed.

FIELD CROPS

The development of field experiments in agricultural research, I–III, T. EDEN (*Trop. Agr. [Ceylon], 84 (1935), Nos. 2, pp. 63–69, pl. 1; 3, pp. 131–149, pl. 1; 4, pp. 188–195*).—The progress of field experimentation during the past century is reviewed, the merits of the different methods developed are appraised, and remarks are made on the place of field experiments in future schemes of agricultural research.

The relation of varying rainfall to soil heterogeneity as measured by crop production, W. H. METZGER (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 274–278, figs. 2*).—Study of the variability of crop yields, 1925–34, from uni-

formly cropped but otherwise untreated field plats at the Kansas Experiment Station revealed high negative correlations between rainfall for the crop year and soil heterogeneity as reflected in crop yields. Low rainfall, under conditions at Manhattan, Kans., caused high variability in the crop-producing power of the soil of these plats, while with adequate rainfall the soil produced much more uniform crops. Calculations from data of the Oklahoma Experiment Station (E. S. R., 70, p. 747) showed a similar relationship between moisture supply in the soil and yield variability. The existence of such a relationship emphasizes the need for smaller plats and more replications in many field experiments, and limits decisively the value of a uniform cropping period as a means of establishing definite variability in the crop-producing power of a group of experimental plats.

[Agronomic experiments in Massachusetts], A. B. BEAUMONT, W. S. EISENMENGER, M. E. SNELL, E. F. GASKILL, R. W. DONALDSON, L. S. DICKINSON, and E. B. HOLLAND (*Massachusetts Sta. Bul. 315 (1935), pp. 9–12, 15, 16, 27*).—Field crops research again reviewed briefly (E. S. R., 71, p. 463) comprised variety trials with potatoes, alfalfa, red clover, lespedeza, and vetch and field peas alone and with companion crops; and forage crops experiments including pasture studies, trials of annuals including soybeans, millet varieties, and Sudan grass as emergency hay or green manure, planting tests with crimson clover, comparison of hulled v. unhulled sweetclover seed, preseeding fertilizer studies, and a test of a nonmercuric fungicide on fine turf grasses. Tobacco experiments dealt with cropping systems, nitrogen carriers, proportion of organic: inorganic nitrogen in the fertilizer, methods of applying fertilizers, the toxicity of aluminum for tobacco, and nitrogen intake of Havana seed tobacco in relation to nitrogen synthesis and quality of leaf.

[Field crops work in Nebraska] (*Nebraska Sta. Rpt. [1934], pp. 8–13, 15, 30, 31, 32, 33*).—Agronomic research (E. S. R., 72, p. 758) reported on from the station and substations included in addition to work already noted, variety tests with oats, barley, wheat, corn, grain sorghum, sorgo, alfalfa, and annual and biennial forage crops; breeding work with corn, wheat, potatoes, oats, and alfalfa; studies of storage of seed and strain tests, both with potatoes; cultivation (including planting) experiments with corn and wheat; sweetclover for temporary pastures; efforts to improve permanent pastures and meadows; weed control; rotation and tillage studies on dry land; and rotations under irrigation. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops research in Rhode Island] (*Rhode Island Sta. Rpt. [1934], pp. 56, 57, 58, 62–64, 72*).—Progress is reported briefly from potato experiments on variations in the nitrogen and potassium in the fertilizer, potash carriers, and source of seed trials; variety trials with lawn and turf grasses, lespedeza, soybeans, and silage corn; fertilizer experiments with lawn and turf grasses and bentgrass for seed production; response of grasses in pure culture to phosphorus carriers; control of lawn pests and weeds; a study of resistance of lawn grasses and weeds to aluminum in solution cultures; breeding work with alfalfa; and effect of crops on succeeding crops.

[Reviews of forage crop research] (*Imp. Bur. Plant Genet., Herb. Plants [Aberystwyth], Herb. Rev., 1 (1933), Nos. 2, pp. 47–58, 61–80; 3, pp. 83–99, 104–112, pls. 7; 4, pp. 125–128, 132–136, 142–159, 161–171*).—Supplementing the articles contained in the first number of this publication (E. S. R., 69, p. 320), No. 2 includes A Review of Forage Crop Research in the Prairie Provinces of Canada, by J. R. Fryer (pp. 47–55); Soybean Investigations in the United

States, by *W. J. Morse* and *G. C. Fuller* (pp. 55–58); and The Pretreatment of Forage Crop Seeds During Germination, by I. S. Travin (pp. 61–64); and reviews entitled Materials for the Solution of the Fodder Problem in Subtropical Regions of U. S. S. R. (pp. 65–71), Natural Fodder Resources in the Lower Volga Region, Western Kazakstan, and Transcaucasia, U. S. S. R. (pp. 71–73), Vernalization in Relation to Plant Histology (pp. 74, 75), and Some Finnish Pasture Literature 1931–32 (pp. 75–80).

No. 3 includes Pastures and Pasture Experimental Work in Finland, by C. A. G. Charpentier (pp. 83–85): Breeding of Herbage Plants at Tammisto, by O. Valle (pp. 85–88); The Nitrogen Nutrition of Plants, by A. I. Virtanen (pp. 88–91); The German Agricultural Society, by H. Koch (pp. 92, 93); Grassland Investigations in the Central Provinces, India, by D. N. Mahta (pp. 93, 94); Crotularia in the United States, by R. McKee (pp. 95, 96); and the Effect of Climate on the Composition of Pasture Plants, by A. E. V. Richardson (pp. 96–99); and reviews entitled The Calculation of Seed Quantities in Seeds Mixtures (pp. 104–111), and The German System of Calculating Pasture Yield (pp. 112, 113).

No. 4 includes The International Test of Types of Lucerne, by R. O. Whyte (pp. 125–128); Indigenous Red Clovers of the Soviet Union, by P. I. Lissitzyn (pp. 132–135); New Technique in Lucerne Breeding, by R. E. Dwyer (pp. 135, 136); Mountain Grasslands in Sweden, reviewed by R. P. Jones (pp. 142–145); The Forage Value of *Artemisia sieversiana* (pp. 145, 146); Forage Crop Research in Prussia, reviewed by G. M. Roseveare (pp. 147–151); Research on Fodder Crops and Grasses in India (pp. 151–155); Grassland Investigations in Western India, by L. S. S. Kumar and S. R. Godbole (pp. 156–159); and Selected Bibliography on the Taxonomy and Agricultural Botany of Herbage Gramineae—I. *Poa*, compiled by M. Hall (pp. 161–171).

[Forage crops investigations in Wales] (*Welsh Jour. Agr., 11 (1935), pp. 96–188, 225–236, pls. 3, figs. 2*).—Additional research (E. S. R., 71, p. 620) with forage crops, meadows, and pastures, conducted in Wales, is reported in articles entitled Pasture Management and its Effect on the Sward, by L. I. Jones (pp. 96–120); The Wintering of Sheep on Temporary Grasses, by M. Griffith and P. M. G. Hutton (pp. 121–125); A Comparison of the Composition of Hill Swards under Controlled and Free Grazing Conditions, by W. E. J. Milton (pp. 126–132); Comparison of (a) an Old with a Temporary Pasture, and (b) Two Temporary Pastures from One of which Wild White Clover had been Omitted at Seeding Down, by E. J. Roberts (pp. 132–139); A Preliminary Report on the Work of the Cahn Hill Improvement Scheme, by M. Griffith (pp. 140–147); Field Trials with Pedigree and Indigenous Strains of Grasses, by M. T. Thomas (pp. 147–157); Seed Production in Cocksfoot: Density of Spacing in Relation to Yield, by G. Evans (pp. 158–164); The Efficiency of Spatial Isolation in Maintaining the Purity of Red Clover, by R. D. Williams and G. Evans (pp. 164–171); The Soil Establishment of Pedigree and Commercial Strains of Certain Grasses, by W. E. J. Milton (pp. 171–181); Proliferation in *Cynosurus cristatus*, by W. A. Jacques (pp. 182–188); and The Effects of Varying the Distance to which Swedes are Singled, by T. Whitehead (pp. 228–235). Papers by T. Whitehead on The Value of Second-Growth Potato Tubers for Seed Purposes (pp. 225–228), and A Note on "Brown Heart", a New Disease of Swede, and its Control [apparently boron deficiency] (pp. 235, 236), are also included.

[Agronomic research at the University of Nanking, China] (*Univ. Nanking, Col. Agr. and Forestry Buls. 18, n. ser. (1934), pp. 16, Eng. abs. pp. 15, 16; 19, pp. 17, Chinese abs. p. 17; 20, pp. 13, fig. 1, Chinese abs. p. 13; 21, pp.*

[5]+70, *pls. 3, figs. 3, Eng. abs. pp. 63–65; 24, pp. 26, Eng. abs. pp. 14–16; 25, pp. 15, Eng. abs. pp. 7, 8; 26, pp. 22, figs. 7, Eng. abs. pp. 20–22*).—Recent research with field crops is reported in the following publications:

No. 18. *Report of soybean improvement work of the department of agronomy, University of Nanking*, S. Wang.—Breeding work with soybeans brought forth a promising new strain, Nanksoy 332.

No. 19. *A preliminary report on the inheritance of nematode resistance and length of beak in a certain wheat cross*, T. H. Shen, S. E. Tai, and W. L. Chia.—In a cross between the long beaked (21.45 mm) Kanred, showing resistance to nematode, and a native short beaked (2.63 mm) wheat susceptible to nematode, studies into F_3 showed the short beak partially dominant over the long, with apparently not more than 3 genes involved. Resistance to nematode seemed rather complicated in inheritance with no indications of a definite genetic ratio in F_2. No linkage could be detected between beak length and reaction to nematode.

No. 20. *Breeding rice in China for resistance to the stem borer*, T. H. Shen and H. N. Shen.—In studies of the reaction of rice varieties to the stem borer (*Schoenobius incertillus* and *Chilo simplex*), 1929–33, a strain 1–3–86 had the lowest percentage of damage. Ningpo Sen rice, classed as a resistant strain, was damaged less by borer than 1–3–86 in 1933. Its ability to produce about 70 percent more tillers than other rices seemed related to its low percentage of damage. Correlations indicated that a resistant rice variety should be low in the percentage of injured culms either with empty heads or fruitful heads.

No. 21. *A study of methods of certification and distribution of seed of improved strains*, C. M. Heh.—Crop improvement and seed certification work in the United States and Canada is reviewed in some detail with the aim of establishing such enterprises in China. Tentative plans are outlined.

No. 24. *Studies of some remedies for the missing plants in kaoliang experiments*, T. S. Hsu.—Uneven stands in kaoliang experiments attributed to several causes mentioned might be avoided by planting early and thinning twice to avoid mole crickets; by bagging the seed heads when blooming begins and removing the bags 9 days later to prevent mold with decreased vitality and germinability; irrigation before planting in dry seasons; and proper seed beds. Transplanting affected yields greatly and could not be used to obtain a satisfactory stand. Missing hills did not affect yield significantly, providing no more than 4 plants were missing in a 30-ft. row. Rows with more than 5 plants missing should be discarded.

No. 25. *Study of natural crossing in kaoliang*, T. S. Hsu.—Natural crossing between 2 kaoliangs grown at Peiping in 2 yr. ranged from 0 to 19.89 percent, averaging 3.91, indicating that bagging is needed in pure-line breeding. Direction of winds and influence of insects were factors involved. Varieties evidently should be planted at least 400 ft. apart to avoid cross-pollination.

No. 26. *Regional tests of promising varieties of wheat*, C. M. Heh.—Adaptations of several established varieties in different regions are described.

How long do roots of grasses live? L. A. Stoddart (*Science, 81 (1935), No. 2109, p. 544*).—A method involving the placement of permanent marked bands on roots was found satisfactory for measuring the life span of roots of grasses at the University of Nebraska. Tests indicated that both seminal and nodal roots of prairie grasses, even under adverse conditions, may live longer than 2 yr.

The use of an evaporation index in watering lawns, J. D. Wilson and F. A. Welton (*Ohio Sta. Bimo. Bul. 174 (1935), pp. 118–119, figs. 2*).—In further tests in 1934 on Kentucky bluegrass lawns (E. S. R., 72, p. 608), the plat

receiving 1 in. of water (about 620 gal. per 1,000 sq. ft., or 27,000 gal. per acre) every time the Livingston black atmometer lost 320 cc of water, without a rain of 0.5 in. or more intervening, showed the best or most uniform growth of grass as compared with 240 and 400 cc evaporation increments. The water received by this plat (rainfall + irrigation) totaled 27.69 in. from May 1 to August 31, inclusive, or 1.8 times normal rainfall for the period and 3.75 in. more than evaporation from a free-water surface. Indications were that at Wooster, lawns need water during summer somewhat exceeding that lost by evaporation from a free-water surface during the same period and about 75 percent more than normal rainfall. Thus, the addition of the extra inches of water over those falling as rain (12+(normal−actual rainfall), which will vary somewhat from year to year with the evaporation) can be regulated efficiently as to time and quantity by the use of an evaporation index corresponding to a loss of 320 cc of water from a Livingston, standardized black atmometer. This insures application of water before growth is checked because of soil-moisture deficiency, or about 4 or 5 days before the grass is visibly injured.

Pasture management for high quality feed at low cost, H. B. Sprague (*New Jersey Stas. Circ. 351 (1935), pp. 15, figs. 4*).—Practices are suggested for improving permanent pastures, including the removal of trees and shrubs, mowing, systematic grazing, spreading droppings, and fertilizing, especially with nitrogen, for intensive grazing; and for meeting the mid-summer feed shortage with temporary pastures as Sudan grass alone or with soybeans, sweetclover, stubble or seedling pastures, and second-growth alfalfa and clover. Pasture management systems outlined include one with little cash outlay, another for soil improvement, and an intensive system involving nitrogen fertilizers.

The place of legumes in pasture production, E. N. Fergus (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 367–373*).—Citing data from agronomic experiments with pasture at the Kentucky Experiment Station, the author observes that legumes improve pastures by directly and indirectly increasing the total dry matter production, by improving the vigor of grass sods and preventing weed growth, and by increasing the protein and mineral content of pasture herbage.

An all-year pasture system for Missouri, W. C. Etheridge, C. A. Helm, and E. M. Brown (*Missouri Sta. Circ. 186 (1935), pp. 12, figs. 3*).—The pasture system described with cultural, varietal, and grazing suggestions consists of bluegrass pasture in late spring, early summer, and winter, Korean lespedeza in mid-summer and late summer, and barley or other grain pasture through the whole fall and early spring. This sequence gives its best results on the more productive soil types and elsewhere on land of average to good fertility, while on areas of medium to low fertility the combination of redtop, lespedeza, and rye will generally be found more practicable than any other for the all-year pasture plan. The merits of sweetclover, Sudan grass, winter vetch, and crimson clover for pasture are noted briefly.

Varieties of spring grains for irrigated areas of southern New Mexico, J. C. Overpeck (*New Mexico Sta. Bul. 228 (1935), pp. 14*).—Outstanding varieties in tests at the station, 1925–34, included Sonora wheat; Red Rustproof oats, especially Ferguson No. 71 and No. 922; and Club Mariout barley. Barley, which produces more feed per acre, is suggested in preference to oats. The growing of small grains on irrigated lands in southern New Mexico, largely to supply local needs, should be limited to the heavier soil types, since yields on light, sandy soils have been disappointing.

An analysis of soil and seasonal effects in alfalfa variety tests, H. M. Tysdal (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 384–391*).—The number of years of testing required for a reliable index of yielding ability and the relative importance of place effect were studied in alfalfa variety trials conducted at Redfield, S. Dak., Manhattan, Kans., Holgate, Ohio, and Lincoln, Nebr.

The correlation coefficients between 1 or 2 years' yield and the final yield were very high, and 2 years' yield results appeared practically as indicative of yielding ability as 3, 4, or 5 years' results. Analysis of variance of alfalfa variety tests indicated greater variability due to place effect than to seasonal effect. According to variance and paired comparison analysis, significant differences between replicates of the same variety (the check) could be found in all tests. The higher correlation found between yields of varieties one year with the next from the same plats than between 2 different fields for the same year planted to the same varieties emphasized the importance of field heterogeneity and that prolonged tests from the same plats do not serve to compensate for these errors.

Varietal survival of alfalfa on wilt-infested soil, L. F. Graber and F. R. Jones (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 364–366*).—The Wisconsin Experiment Station cooperating with the U. S. Department of Agriculture compared winter-hardy and wilt-resistant Ladak and Turkistan alfalfa with winter-hardy, wilt-susceptible Grimm, Canadian variegated, and Cossack, and with susceptible, moderately hardy Montana and South Dakota common alfalfa. All were grown on a wilt-infested (*Phytomonas insidiosa*) field cut twice annually for five consecutive years. Wilt appeared in the summer and fall of the third year, and all susceptible varieties, except Cossack, were eliminated rapidly and almost completely by the disease and winter injury at the end of the third and fourth cutting years. Cossack, while severely diseased, was intermediate in survival between the rest of the susceptible and the wilt-resistant sorts, but only the resistant Ladak and Turkistan maintained good stands at the end of the fifth year. Wilt infection appeared to reduce winter survival of such normally hardy and susceptible alfalfas as Grimm, Canadian variegated, and Cossack, so that they appeared superficially like nonhardy sorts after infection.

Experiments with curing alfalfa hay, H. C. Rather and R. H. Morrish (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 212–219, figs. 3*).—Comparisons of several curing practices with alfalfa hay, 1932–34, showed that the curing of alfalfa in the swath is unsatisfactory, swath-cured alfalfa always being lowest in protein content. The ground from which such hay was raked was coated with shattered leaves and the hay was stemmy and brittle and appeared faded or bleached. Alfalfa windrowed 24 hr. after cutting likewise lost considerable leaves and generally was lower in protein, although the loss was not always serious. Hay cured in cocks was satisfactory in quality, usually having a slight advantage in protein content, but this curing method required extra labor to build the cocks and materially longer to dry the hay down enough for storage. Raking the hay soon or within a few hours of cutting and curing in windrows was the most practical curing system tested. Practical suggestions for curing in cocks on small acreages and windrowing for large acreages in dry and wet weather are outlined.

Bean hybridization, E. E. Down (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 318, 319*).—Points considered essential for the successful hybridizing of beans in the greenhouse, as followed at the Michigan Experiment Station, are outlined briefly.

The relative seed yields in different species and varieties of bent grass, H. F. A. North and T. E. Odland (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 374–383, fig. 1*).—Seed production experiments at the Rhode Island Experiment Station, 1928–34, included 12 different bentgrasses grown under rather high fertility conditions. Colonial and velvet bents continued relatively free from weeds and mixtures in practically full stands. Although mixing with colonial bent was evident in plats of redtop before liming, the stands continued relatively pure. Stands of creeping bent were short-lived and permitted invasion by weeds and other bents. Average cleaned seed yields per acre, 1930–34, were for redtop (*Agrostis alba*) 217 lb.; colonial bent (*A. tenuis*)—Rhode Island 114, Astoria 137, Oregon 62; creeping bent (*A. palustris*)—Metropolitan 121, Virginia 113, Washington 72; seaside bent—Coos Co. (Oreg.) 129, Marshfield (Oreg.) 105, Oregon 63; and velvet bent (*A. canina*)—Highland 131, Kernwood 79, B. P. I. 14,276 58, and Yorkshire 17 lb. Indications were that the improved vegetative strains of velvet bent can be grown successfully for seed production, whereas stolon strains of creeping bent are harder to grow for seed.

Analysis of variance of corn yields obtained in crop rotation experiments, R. J. Garber and T. C. McIlvaine (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 480–485*).—The results of an analysis of variance of the corn yields obtained, 1925–33, in three 4-yr., three 3-yr., and three 2-yr. rotations in a crop rotation experiment (E. S. R., 55, p. 617; 64, p. 417) at the Lakin, W. Va., Experiment Farm are presented. An example of a systematic arrangement of plats that proved truly representative is given.

Rate of planting corn under irrigated conditions, W. H. Leonard and D. W. Robertson (*Colorado Sta. Bul. 417 (1935), pp. 11*).—Planting experiments, 1930–33, involving Golden Glow, Pride of the North, and Minnesota No. 13, grown 3, 4, and 5 plants per hill in hills 3 ft. apart in 3.5-ft. rows and in drill rows with plants 3, 6, 9, and 12 in. apart in the row, indicated that 4 plants were preferable to 3 per hill on fertile irrigated soils with dependable water rights. The 4- or 5-plant rates gave more shelled corn and more fodder per acre than the 3-plant rate. Recommendations are that drilled corn be spaced 6 to 9 in. between plants in the row for the highest shelled grain and forage yields. Wider distances between plants gave larger ears at the expense of yield.

Losses to the corn crop caused by leaf injury, G. H. Dungan (*Plant Physiol., 9 (1934), No. 4, pp. 749–766, figs. 6*).—Experiments were conducted at the Illinois Experiment Station during 5 yr. with corn to determine the influence of blade removal and other leaf and plant characters upon the quantity and quality of grain produced.

The critical stage for leaf injury was found to be when the ear shoots were just emerging. Leaf removal and injury before or after this stage was progressively less harmful to yields and became very slight in the dent stage. Grain quality as indicated by test rate per bushel was lowered most by leaf removal when developing grains were in the blister stage, although rotting of ears following the bruising action of simulated hailing was worst when the treatment was received during the early milk stage. When the sides of the blades were torn from the midribs but left intact to the base, the resulting yield was 75 percent higher than with complete blade removal. Yield reductions at all growth stages corresponded roughly with the percentage of leaf area removed, suggesting the possibility of estimating the loss from hailstorms from a determination of the leaf surface destroyed. See also a previous note (E. S. R., 62, p. 519).

The correlation of certain characters in Egyptian cotton, C. H. Brown (*Empire Cotton Growing Rev., 12 (1935), No. 3, pp. 216–220, figs. 9*).—In studies by the Egyptian Cotton Research Board, seed weight was correlated positively with boll-content weight and with hair weight per centimeter. Ginning percentage was correlated negatively with seed weight, and correlation was absent between ginning percentage and halo length and between boll-content weight and hair weight per centimeter.

Anthesis and pollination in Bengal gram (Cicer arietinum), V. Ramanatha Ayyar and R. Balasubrahmanyan (*Madras Agr. Jour., 23 (1935), No 5, pp. 170–178*).—Cleistogamy was present and its percentage seemed related to soil nutritional conditions. Blooming was active between 9 and 10 a. m. on the first day. Most flowers in the summer crop opened at 2 p. m. Petals opened and closed much earlier on the second day of opening. Anther dehiscence and pollination occurred 1 day before flowers opened and there was little cross-pollination. The crossing method found successful is described.

Shortening the rest period of the tubers of the Jerusalem artichoke, Helianthus tuberosus L., E. S. Haber (*Iowa State Col. Jour. Sci., 9 (1934), No. 1, pp. 61–72*).—The rest period of dormant tubers of Jerusalem-artichokes was shortened by storage at temperatures near or slightly below freezing in experiments at the Iowa Experiment Station. The length of the rest period or dormant stage depended directly on storage temperature, decreasing as the temperature declined to slightly below freezing. Ethylene chlorohydrin and thiourea were somewhat effective in shortening the rest period, more so than sodium thiocyanate, while sodium nitrate was without effect. Tubers harvested September 27, while considerably less mature than those harvested November 1, germinated as promptly. Thiourea caused multiple sprouting, more pronounced when tubers were treated after dormancy was broken. Tubers held 3 mo. or longer, at temperatures near freezing, tended to produce more than one sprout per seed piece.

The effect of soil conditions and treatment on yields of tubers and sugar from the American artichoke (Helianthus tuberosus), H. B. Sprague, N. F. Farris, and W. G. Colby (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 392–399*).—The tuber yields of Improved White artichokes at the New Jersey Experiment Stations were affected greatly by soil texture, presumably through soil moisture relations during the critical period of tuber formation, August 15 to October 15. Loams (Sassafras) distinctly surpassed light sandy loams in dry seasons, whereas sandy loams (Sassafras) were superior to heavier types in abnormally wet years.

On a light sandy loam with pH 5.9 and relatively low in organic matter, lime and 6–8–4 fertilizer increased tuber yields 39.8 percent over lime alone and 46.6 percent over untreated plats, and 8–8–6 fertilizer alone increased yields 48.7 percent above untreated plats. These were the most profitable fertilizers tested. Increasing the fertilizer from 500 to 1,000 lb. per acre did not raise yields in the test period, indicating a much smaller need than potatoes for plant nutrients.

The total hexose sugar (largely levulose) content obtained on acid hydrolysis of tubers ranged from 14.6 percent in a moist year to 19.3 in a dry season. Much of the fluctuations in sugar content in a single year is attributed to variations in moisture percentage of the fresh tubers, which seemed to vary with the soil moisture capacity. The total yields of hexose sugars per acre were greatest with lime and 6–8–4 or 4–8–2 fertilizers, or with 8–8–6 fertilizer alone. Yields of hexose sugar ranging from 2,500 to 3,300 lb. per acre are indicated as average in normal seasons on suitable soils.

Defoliation experiments with kaoliang (*Andropogon sorghum*), H. W. Li and T. N. Liu (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 486–491*).—Significant reductions in grain yields of kaoliang at the Honan (China) University followed removal of 2 leaves every other 5 days starting July 5, removing all leaves on August 1 at about the dough stage, and defoliation at the milk stage. The greatest reduction occurred after the removal of all leaves when two-thirds of the heads had reached the blooming stage. Removal of leaves when each plant reached the dough stage did not produce a significant yield decrease, and removal about in the dough stage of all but the 3 top leaves resulted in an insignificant increase over the check. Agreement with the results of Hume and Franzke and those of Dungan (E. S. R., 62, p. 519) with corn was noted. Defoliation of kaoliang at the dough stage evidently results in insignificant reductions in yield and kernel weight, but defoliation before this stage results in reduced yield and kernel weight, the reduction being directly proportional to earliness of defoliation.

Korean and sericea lespedeza on the Southeastern Experiment Farm in 1934, S. C. Hartman (*Ohio Sta. Bimo. Bul. 174 (1935), pp. 125–128*).—The response of Korean lespedeza in competition with other forage legumes on several soil fertility levels is described, and the behavior of *L. sericea* in planting, grazing, and cutting tests is discussed briefly.

Field peas in Colorado, D. Koonce (*Colorado Sta. Bul. 416 (1935), pp. 26+[10], figs. 10*).—Cultural methods, seeding rates, and harvesting and threshing practices deemed suitable for growing field peas in Colorado are described, together with information on adaptation, inoculation, varieties, mixtures with small grains, pasture and other uses, pure seed production, and diseases and insect enemies. The crop is adapted to the mountain valleys, over 90 percent of the 750,000 bu. produced annually in Colorado being grown in the San Luis Valley.

Extensive variety tests at the Fort Lewis Substation near Hesperus, 1922–33, showed French Gray with high seed yield slightly surpassing Golden Marrow, Clamart, and New Canadian Beauty, while Agnes and New Canadian Beauty produced the most air-dry forage. French Gray is indicated for green manure for late planted crops, New Canadian Beauty and Agnes for pasture and hay, and French Gray and Clamart, medium early maturing varieties, for mixture with small grain. Planting tests, 1931–33, suggested about 1.5 bu. per acre for medium-sized peas as Agnes, Clamart, and French Gray. The 8- and 18-in. rows with similar yields produced about 20 percent more grain than 36-in. rows. The wide spacing is recommended when moisture is a limiting factor or to facilitate irrigation and cultivation.

Nodulation of peanut plants as affected by variety, shelling of seed, and disinfection of seed, J. F. Duggar (*Jour. Amer. Soc. Agron., 27 (1935), No. 4, pp. 286–288*).—Spanish and runner peanut plants without artificial inoculation averaged at harvest 11 and 127 total nodules per plant, and 5 and 19 large nodules per plant, respectively, at the Alabama Experiment Station. The runner variety, unlike Spanish, did not seem to be benefited by artificial inoculation. Planting of shelled v. unhulled seed of Spanish peanuts, both without artificial inoculation, did not result in any consistent differences in nodulation, or aggregate dry weight of nuts per plant, or total plant weight, but when both were inoculated plants from unhulled seed averaged significantly larger numbers of both total and large nodules and greater weight per plant of both nuts and entire plant. Such advantages of unhulled seed were attributed to their carrying larger amounts of inoculum into the soil because of their greater size and rougher surface. Soaking unhulled, not artificially inoculated seed peanuts in

various disinfectants tended, with most chemicals, to reduce nodule numbers and germination.

The potato field trial, J. R. LIVERMORE (*Amer. Potato Jour., 12 (1935), No. 6, pp. 142–150*).—This contribution from Cornell University points out to potato investigators some principles involved in the application of certain methods of statistical analysis which may be used to reduce the data, with particular attention to the analysis of variance method.

Fertilizer placement studies with potatoes in 1934, B. E. BROWN and G. A. CUMINGS (*Amer. Potato Jour., 12 (1935), No. 7, pp. 178–182*).—Results in cooperative placement experiments (E. S. R., 72, p. 470) for 1934 confirmed previous studies in that in general side placement of fertilizer gave higher yields than fertilizer applied either under or over the seed piece, whether mixed with the soil or in bands. Side placement on a level with the seed always gave higher yields than comparable side placement 2 in. below seed level. Mixing the fertilizer with the soil around the seed piece was consistently the poorest placement.

The rational use of lime in potato production in eastern Virginia, J. B. HESTER (*Virginia Truck Sta. Bul. 83 (1934), pp. 1137–1154*).—The effects of 6 liming materials, including hydrated calcium and dolomitic limes, calcium and dolomitic limestones, oyster shell, and marl on potato yields, soil reaction, and replaceable bases were studied, 1932–34, on Sassafras sandy loam at Onley, Va. The materials were applied on the basis of 560 and 1,120 lb. of calcium oxide per acre.

The finely processed materials had the quickest effect on soil reaction and crop yield, although at the end of 18 mo. soil reactions on all of the limed plats were at about the same level. The dolomitic limes gave the largest return in yield. The available magnesium oxide in the check plat, 124 lb. v. calcium oxide 784 lb., was doubled and tripled, respectively, by the light and heavy applications of dolomitic limestone, and the calcium oxide was increased but not in proportion to the magnesium. The amounts of calcium oxide or magnesium oxide equivalent per acre indicated for soils testing pH 4.5 and below were for sands 400 lb., fine sands 550, and sandy loams 700 lb., and for soils testing pH 4.7, 200, 350, and 500 lb., respectively. Ordinarily not over 1,000 lb. of hydrated lime is recommended for average potato soils.

Information also is included on soil needs of potatoes, potato soil types, and relation of liming to injury by potato scab.

The relation of some plant characters to yield in sorghum, G. N. RANGASWAMI AYYANGAR, M. A. SANKARA AYYAR, P. V. HARIHARAN, and D. S. RAJABHOOSHANAM (*Indian Jour. Agr. Sci., 5 (1935), No. 1, pp. 75–100*).—Correlations between grain yield per plant and 8 other plant characters were determined in 2 irrigated and 3 dry-land varieties of sorghum. Diameter of peduncle, weight, length, and thickness of head, and stover which gave high positive correlations with yield are considered as reliable indices in selecting for high yield. Weight per 100 kernels gave high correlation values in the irrigated varieties and low in the 3 dry sorghums. In the 2 irrigated sorts, duration (days from planting to anthesis) was correlated negatively with yield. Indications were that the total grain yield of a plant can be predicated very closely when the diameter of peduncle, length and thickness of head, and weight per 100 kernels are all known.

Germination tests on sorghum seeds preserved in earhead, G. N. RANGASWAMI AYYANGAR and M. A. SANKARA AYYAR (*Madras Agr. Jour., 23 (1935), No. 5, pp. 179, 180*).—Sorghum grain retained viability longer when stored in heads than stored as threshed grain, irrigated varieties deteriorating faster than

dry-land sorts. Little germination was found in the sixth year and none thereafter.

Sugarcane in Burma, A. McLean (*Burma Dept. Agr., Agr. Survey 19 (1934), pp. [6]+66, pls. [14]*).—This survey deals with the history of sugarcane in Burma, varieties, pests and diseases, cultural and manufacturing practices, and the scope of the industry. Results of variety, fertilizer, and cultural studies at the Pyinmana Central Farm are detailed, with remarks on white sugar manufacture in that area.

Wrapper tobacco, D. B. Paguirigan and P. Tugade (*Philippine Jour. Agr., 6 (1935), No. 1, pp. 1–114, pls. 29, figs. 8*).—Intended as a guide to wrapper tobacco culture in the Philippine Islands and elsewhere, this paper treats of the sources of wrapper tobacco, its climatic, soil, and fertility requirements; varieties and breeding; plant bed and field operations; shade growing; curing, fermenting, and preparation for market; yields and production costs; insect pests and plant diseases; marketing and commercial movements; and cigar manufacture and utilization of wrappers. The classification and baling of Sumatra wrappers and Cuban shade-grown tobacco and standard grades of Connecticut Havana seedleaf and broadleaf are appended with a bibliography embracing 148 titles.

Two new methods of distinguishing certain Canadian wheats, J. G. C. Fraser and F. Gfeller (*Sci. Agr., 15 (1935), No. 8, pp. 564–572, figs. 3; Fr. abs., p. 572*).—Light brown color reaction of wheat kernels to phenol (E. S. R., 72, p. 44) was obtained with Red Bobs, Supreme, Early Triumph, Ruby, Parker Selection, and Red Fife wheat, whereas a dark brown reaction was given by Marquis, Reward, Garnet, Ceres, and Huron. All of the spikes of these wheats colored brown except those of Garnet, which remained white. Immature samples did not produce the same degree of color as a fully mature sample.

Mean depths of kernels and lengths of germs of seeds soaked in water for 16 hr. for varieties grown at four stations in Canada in 1934 were, respectively, for Garnet 2.54, 2.5 mm; Early Triumph 2.84, 2.33; Ceres 2.96, 2.31; Reward 2.88, 2.22; and Marquis 2.87, 2.14 mm.

Environment seems to contribute more to the variability of length of germ and depth of kernel than differences within a variety in a district. Garnet wheat was distinguished readily by its acute germ inset. The systematic value of length of germ and depth of kernel was a striking example with Garnet kernels. There was also evidence that the phenol color reaction accentuated the well-known brush characters and was valuable in separating Marquis from a mixture of Garnet and Reward.

Summary of results of seed and legume inoculant inspection for 1934, J. G. Fiske (*New Jersey Stas. Bul. 584 (1935), pp. 20*).—The dealers in New Jersey from whom the 2,064 official samples of crop and vegetable seed and seed mixtures were collected in 1934 are listed with compliances and violations indicated; and the crops, inoculation, number of organisms, and viability are shown for 46 official samples of legume inoculants.

Tolerance of certain weeds and grasses to toxic aluminum, B. E. Gilbert and F. R. Pember (*Soil Sci., 39 (1935), No. 6, pp. 425–429, pl. 1*).—Various weed species commonly found in competition with lawn grasses were observed to vary greatly in their sensitivity to aluminum in solution cultures at the Rhode Island Experiment Station, which suggested that toxic aluminum in the soil solution may be one of the causes of the inhibition of weed growth on acid soils.

The eradication of gifblaar (Dichapetalum cymosum), A. C. Lehmann (*Farming in So. Africa, 10 (1935), No. 111, pp. 235–236, figs. 10*).—Gifblaar may be destroyed by determining the main stem and digging a hole 9 to 12 in.

deep around it with a special mattock without breaking the branches; ringbarking with a frilling-knife a length of 8 in. for 2.5-in stems, 4 in. for 1-in. stems, and not less than 2 in. for smaller stems; and packing at once between stones around the ringbarked area a dry-powdered mixture of calcium chloride 2 parts, copper sulfate 1, and soil 2 parts, at rates of 2 lb. for 2-in. stems, 1 lb. for 1-in., and 0.5 for 0.5-in. stems. Success is indicated within 2 days by dying leaves. Research on which this method is based will be reported elsewhere.

HORTICULTURE

Hortus, compiled by L. H. and E. Z. BAILEY (*New York: Macmillan Co., 1935, rev. ed., pp. 755, pls. 16, figs. 22*).—A revised edition with supplement (E. S. R., 65, p. 227).

[Horticultural studies by the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 13, 14, 58, 59, 62–73, 80*).—There are presented brief reviews of results on the following projects: Onion set production and onion breeding, both by M. E. Snell; breeding snapdragons for varietal improvement and disease resistance, propagation of geraniums, and the effect of plant nutrients, soil reaction, and lime on gardenias, all by H. E. White; germination of packet seeds, by G. B. Snyder; germination, varieties, etc., of sweet corn, by A. P. Tuttle and Snyder; varieties and fertilizer and cultural requirements of asparagus, improvement of beans, peppers, tomatoes, and other vegetables by plant selection, and storage of Pascal celery, all by R. E. Young; winter injury to fruits, by F. C. Sears; the interrelation of stock and scion in apples, by J. K. Shaw; tree characters in fruits, by Shaw and A. P. French; genetic composition of peaches, by J. S. Bailey and French; pruning of bearing fruit trees, by Shaw and O. C. Roberts; culture v. sod for apples, comparison of clover sod and grass in a sod mulch orchard, nitrating of fruit trees, cultivation v. mulching for apples, effects of fertilizer limitation on fruit plants, role of potash and lime in peach tree nutrition, and effect of potash and lime on apple trees, all by Shaw; varieties of apples, peaches, plums, grapes, and raspberries, by Shaw and Roberts; fruit bud formation in the strawberry, by R. A. Van Meter; storage of apples, by Roberts; spray residue removal, by Roberts and Shaw; blueberry culture, by Bailey; and the value of electricity for heating hotbeds and propagating benches and results of variety tests of vegetables, both by P. W. Dempsey.

[Horticultural studies by the Nebraska Station] (*Nebraska Sta. Rpt. [1934], pp. 14, 15, 16, 32*).—Brief mention is made of the progress of studies relating to the growth of apple roots and fruit, the effect of mulching grapes on soil moisture, the pruning of apples, the spacing and pruning of raspberries, rootstock influences in the apple, culture and fertilization of vegetables, and varieties of fruits tested at the North Platte Substation.

[Horticultural notes] (*Farm Res. [New York State Sta.], 1 (1935), No. 4, pp. 2, 8*).—Articles are included entitled Long Island Farm for Vegetable Researches, H. S. Cunningham (p. 2), and The "Gil" Peck Cherry (p. 8). A note is also given on the successful propagation of hop plants from summer growth in the greenhouse.

[Horticultural studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1934], pp. 59–61, 64–67, 73, 87–91*).—The station here reports upon investigations on the fertilizer requirements of market garden crops; stable manure v. green manure for vegetables; variety and strain tests of vegetables; blackberry breeding; raspberry and grape fertilization; winter injury to peaches, nectarines, and apricots; sprays for the plum orchard; forcing of rhododen-

drons; and growing early beets and lettuce with green manure, by F. K. Crandall.

Vegetable growing, J. E. KNOTT (*Philadelphia: Lea & Febiger, 1935, 2. ed., rev., pp. 361, figs. 70*).—This is a revised edition (E. S. R., 62, p. 886).

Vegetable variety and strain trials, 1933–34, W. B. MACK, G. J. STOUT, and F. W. HALLER (*Pennsylvania Sta. Bul. 313 (1935), pp. 36, figs. 5*).—Discussing briefly the limitations of variety trials, the authors present the results of observations on extensive collections of beans, beets, cabbages, celery, tomatoes, and other vegetables. Important differences were observed between strains within a single variety; for example, in the Detroit Dark Red beet the strains varied widely in color, size, shape, and freedom from leaf spot. Among promising new vegetables were Perfection, Morse Bunching, and Imperator carrots; Asgrow 40 and Morse Market peas; Perfected Detroit, Ohio Canner, and Good for All beets; Spanish Gold Top Cross×39 and Golden Sunshine Top Cross sweet corns; King of the North pepper; and Asgrow Scarlet Dawn tomato.

The effect of magnesium arsenate spray applied at various pump pressures on the yield of bush lima beans, L. W. BRANNON (*Virginia Truck Sta. Bul. 85 (1934), pp. 1195–1201*).—Contrary to the assumption on the part of certain growers that high-pressure sprays reduce the yield of beans by injuring the flowers, there was found in these experiments, which involved the application of magnesium arsenate and plain water sprays at pump pressures of 150, 200, and 250 lb., no significant yield differences on the several plats, as calculated by Student's method. Since very few Mexican beetles were present, insect injury of this type was not a factor in the results. No significant differences were observed between magnesium arsenate and water applied at any given pressure.

The growth of turnips in artificial cultures, H. HILL and E. P. GRANT (*Sci. Agr., 15 (1935), No. 9, pp. 652–659, figs. 5; Fr. abs., p. 659*).—At the Central Experimental Farm, Ottawa, Canada, Candian Gem and Ditmar Swede turnips grown in sand with boron supplied in 0, 0.25, 0.5, 1, and 1.5 p. p. m. showed a marked response to this element. After 6 weeks the turnips receiving no boron manifested definite signs of injury, commencing as a light yellow marginal coloring of the leaves. After 10 weeks injuries were such that two of the plants in the no-boron series were dead, and the roots of all of the plants in this lot were small and shriveled or rotting at the crown. There was a graded improvement in the various lots until in the series receiving 1 and 1.5 p. p. m. the plants were almost of normal appearance. Analyses of the roots showed very low ash in the dry matter of the high-boron series as compared with the low-boron group. Thus there was shown an inverse relationship between the amount of boron supplied and the percentage of ash in the dry matter of the roots. A direct relationship was found between the amount of boron supplied and the amount found in the roots.

Studies in nursery technique: Shield-budding—the removal of the wood, R. J. GARNER (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 123–126*).—Comparing the English method of removing the wood from the bud with that of American propagators, in which some wood is left attached, there were reported in trials with apples, pears, plums, and cherries small but significant increases from successful unions in favor of the English method. There was, however, no significant difference in the height of the trees at the end of the first year, and since the American method is more rapid and less wasteful of buds the author suggests its trial by propagators.

Is fruit thinning necessary in Maryland orchards? A. L. SCHRADER (*Md. Fruit Grower, 5 (1935), No. 5, pp. 1–3, 6*).—The thinning by the Maryland Experiment Station of heavily bearing trees of Stayman Winesap, Jonathan, and Grimes Golden to leave about 1 fruit per 50 leaves increased flower bud formation in Stayman Winesap and Jonathan but not in Grimes Golden, and leads to the deduction that it is likely that so-called annual varieties may be made to bear annually under Maryland conditions if they are not permitted to overproduce. The removal of small and scraggly clusters and the reduction of the remainder to approximately 100 per strong Concord grapevine improved the quality of the fruit and increased the vigor of the vine.

Growing fruit in North Dakota, A. F. YEAGER (*North Dakota Sta. Bul. 280 (1935), pp. 48, figs. 34*).—General information is presented on the locating of orchards, varieties, culture, pruning, pollination, control of insects and diseases, etc.

Some studies in chemical preservation of fruit specimens, E. HUNT (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 196–199*).—Discussing the technic of fruit preservation and the faults of the usual chemicals, such as formaldehyde, alcohol, copper sulfate, and sodium chloride, the author suggests several formulas for fixing and holding solutions that have been used successfully at the University of Minnesota in preserving the fruits and leaves of plums, pears, apples, and strawberries.

The root-systems of some Bramley's Seedling apple trees, A. B. BEAKBANE and A. F. DE WET (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 87–89, pls. 3*).—An examination of the root systems of three 15-year-old Bramley Seedling apple trees growing on Malling rootstocks I, II, and IX showed the same general character of roots as was noted by Rogers and Vyvyan (E. S. R., 72, p. 334) in Lane Prince Albert trees growing on the same understocks. The Bramley group was larger in size, due apparently to the greater vigor of the scion. Grass maintained during a 4-yr. period had no apparent influence on the type of root development.

A comparison of the root-systems of mature trees of Bramley's Seedling and Worcester Pearmain on various rootstocks, W. A. BANE, F. H. BEARD, and A. F. DE WET (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 90–99, pls. 6, figs. 2*).—Bramley Seedling and Worcester Pearmain apple trees worked on different Malling understocks were dug and the root systems examined and compared with those of young unworked understocks. On the whole the root systems of the two varieties resembled in general characteristics those of the unbudded understocks. The exceptions are believed to be the result of age differences rather than scion effects.

An experiment in sampling technique for size and colour of apples: Bramley's Seedling on rootstock No. II, 1934 crop, J. L. EDGAR and A. F. DE WET (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 130–134*).—To determine the size of sample needed in comparative determinations of size and color of apples from different trees or plats, observations were made on the entire crops of eight trees of Bramley Seedling worked on Malling II understocks and also on single sample boxes obtained by taking at random equal numbers of apples from the several boxes comprising the single tree's crop. The original boxes from a single tree were found to vary both in color and size more than did the sample boxes. It was found that the sample boxes were sufficiently uniform to be accepted as representative of the tree's crop. The same degree of accuracy was obtained in grading the sample box as was secured in grading three of the original boxes.

Apple rootstocks immune from woolly aphis: A progress report on trials with new varieties, H. M. Tydeman (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt., 22* (*1934*), *pp. 115–122*).—Records taken on seedlings obtained by crossing the resistant Northern Spy with Paradise types and upon Transparent de Croncels, Winter Majetin, and other resistant varieties showed about one-third of the seedlings to be definitely immune. Four seedlings of Spy × Malling II were increased asexually and budded with Lane Prince Albert. Trees on all four seedling understocks appeared to be definitely more vigorous than those on Malling IX. On the average, none of the four groups were as prolific in blooming as was the Malling IX lot. However, the trees are said to be too young for the drawing of any definite deductions as to fruitfulness.

Ring grafting and stock effect, R. H. Roberts (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 328, 329, fig. 1*).—The replacement of a ring of bark removed from young Whitney crab, Winesap, and Yellow Transparent nursery trees with other rings of known varieties resulted in differences in growth. There appeared to be a significant relation between the accumulation of starch above the rings and the amount of new shoot growth.

Will girdling kill an apple tree? A. L. Schrader (*Md. Fruit Grower, 5* (*1935*), *No. 6, pp. 1, 2*).—The ringing in June 1934 of fruiting trees of Delicious and Stayman Winesap was found by the Maryland Experiment Station to increase fruit bud formation and to have very little influence on growth. Certain nonbearing Delicious trees when ringed matured their leaves a little earlier, and the next spring were a day or two later in opening their blossoms. Ringing did not influence the size of the fruit.

Tree injection: Invigoration by the injection of fertilizers, W. A. Roach (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt., 22* (*1934*), *pp. 135–138, pl. 1*).—Following favorable results secured with potassium nitrate (E. S. R., 72, p. 332), 21-year-old Cox Orange Pippin apple trees were injected with a complete fertilizer solution containing 0.25 percent potassium phosphate plus 0.25 percent of urea at rates varying from ⅒ to ⅙ lb. per tree. The amount of shoot growth, as judged by the weight of prunings, was nearly doubled, and the increases were correlated with the amount of fertilizer injected. Leaf hopper and red spider infestations were markedly less severe on the fertilized trees. The fruits of the heavily fertilized trees were inferior in color and finish.

Spraying apples for the prevention of fruit set, E. C. Auchter and J. W. Roberts (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 208–212*).—Continuing earlier investigations (E. S. R., 72, p. 187), various chemicals were tested in apple orchards in different sections of the United States to locate materials that might destroy the blossom buds without material injury to the tree. Of several inorganic materials (sodium polysulfide, copper sulfate, sodium nitrate, ferrous sulfate, and sodium hyposulfite) applied in the cluster bud stage, none proved reliable in preventing set under all conditions, and all frequently caused severe russeting of the remaining fruits. Oil emulsions used in winter strength did not consistently kill the blossoms and sometimes caused severe spur and foliage injury. Cresylic acid consistently killed practically all blossom clusters but also injured the foliage and spurs. Tar oil distillate proved most promising of the several materials, as it killed practically all the blossoms without any material injury to the spurs and twigs. The leaves were rapidly replaced by new, and fruit buds were apparently formed for the next year.

Rootstocks for pears, R. G. Hatton (*East Malling* [*Kent*] *Res. Sta. Ann. Rpt., 22* (*1934*), *pp. 75–86, pls. 6*).—Observations at the East Malling Research Station on several hundred pear trees of seven varieties growing on different

quince understocks and on pear understocks for comparison indicated that the variety of understock within a species is as much of a factor as species itself. Certain varieties of pear understocks, for example, gave very good results. Of seven quinces compared, only three, designated as A, B, and C, were found worthy of consideration from the commercial viewpoint. The others exhibited a very general incompatibility with the scions, both in the nursery and in the orchard, and in certain lots there was high mortality during the early years. Of the three successful quinces, the C understock tended over a period of years to develop definitely smaller scion trees. However, the C trees were at the end of 12 and 14 yr. significantly superior in yield to those of A and B. There was a slight tendency for the C trees to produce smaller fruits with the passing years. There was a marked tendency for scion roots to develop, and among the three understocks A, B, and C this tendency was most marked in C. The author suggests that scion rooting might be prevented by inserting buds higher up the trunk and by taking care in planting that the union is well above the soil.

Pollination of pears: Results of 1934 tests, E. E. PESCOTT and F. J. GREATOREX (*Jour. Dept. Agr. Victoria, 33 (1935), No. 6, pp. 272–276, 280, figs. 13*).—In these studies, employing the branch unit method, Packham Triumph and Winter Nelis proved satisfactory pollinizers for Josephine de Malines, Kieffer and Howell for Anjou, and Josephine de Malines and Williams Bon Chrètien (Bartlett) for Comice.

The influence of pulp disintegration upon the viability of peach seeds, I. C. HAUT and F. E. GARDNER (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 323–327*).—Peach pits taken from a 20-bu. pile of Elberta fruits, the maximum temperature in the center of which attained 34° C. (93° F.), germinated only 0.88 and 0.13 percent after 5 and 12 days of rotting, respectively, as compared with 27 percent for pits taken from the pile before rotting commenced. A repetition of the experiment with clingstone seedlings showed sharp and consistent reductions in germination through 10 days of rotting. In this case the temperature in the center of the pile reached 44°. Where seeds were soaked in water held at 36° to 40°, 43°, and 52° to 56° for 8 days all were killed. Soaking in peach juice also killed seeds, whereas excellent germination was secured with seeds soaked in water at room temperature or in acetic acid. Apparently there were at least two factors concerned in loss of germination, namely, high temperature and some unknown property of the fermenting juice.

Tree injection: The diagnosis and cure of chlorosis in a peach tree, W. A. ROACH (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 139–141, pl. 1, fig. 1*).—Chlorosis, due apparently to excess calcium occurring in the chalk subsoil, was overcome by the injection of 0.05 percent ferric chloride solution into the main branches of a peach tree. Not only did the foliage recover its normal green, but the young fruits which had remained at a standstill for several weeks resumed growth and developed a crop of nearly normal size and quality.

The susceptibility of flower buds of the Montmorency cherry to injury from low temperature, V. R. GARDNER (*Jour. Agr. Res. [U. S.], 50 (1935), No. 6, pp. 563–572, figs. 7*).—Observing that the percentage of killing of Montmorency cherry flower buds does not consistently correlate with temperature and that there may be considerable variation between individual trees in an orchard, records were taken by the Michigan Experiment Station on random samples of buds collected separately from 149 trees in an orchard at Grand Rapids and from 190 trees in an orchard at South Haven and also from a

number of selected trees and limb sports. The killing of dormant buds rarely exceeded 30 percent, and for the most part was not sufficient to become a major factor in yields. A more serious problem was the killing of partly developed buds in late winter or early spring. Observations in different Montmorency orchards led to the opinion that between 5 and 10 times as many flower buds are killed by this delayed winter-killing as by the much lower winter temperatures. Spring frosts during the late preblooming and blooming stages presented the greatest hazard of all, sometimes destroying all the blossoms. Photomicrographs are presented of sections of normal and injured flowers in the three stages, (1) dormant, (2) soon after growth was resumed in the bud in the spring, and (3) in the preblossoming or blossoming stage. Much individual tree and branch variation in susceptibility was noted in all three stages, although there was very little anatomical difference between the flowers of the relatively hardy or relatively tender forms at the three different periods. Susceptibility to low temperature injury at one stage was not found correlated with susceptibility at another stage.

A comparison of clean culture and sod in a sour cherry orchard, W. TOENJES (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 228–233, fig. 1*).—Observations in a block of Montmorency cherry trees planted 20 ft. apart in the spring of 1920 and maintained partly in clean culture and cover crops and partly in alfalfa sod supplemented with nitrogen showed practically no differences in terminal growth but a significantly larger average trunk circumference increment in the tilled trees. In August 1931 there was recorded an average soil moisture content of 6.8 percent for the clean tilled plats as compared with 9.2 percent in the sod plats. No difference was noted in bud hardiness, percentage of fruit set, or size of fruits between the two treatments. After the first 2 yr. of fruiting the cultivated trees significantly outyielded the sod-grown trees. The trees in the clean culture cover crop area produced considerably higher net returns, but the returns from the sod culture treatment were sufficient to justify this method of culture, particularly for sloping areas where the danger of erosion was present.

Raspberry breeding at East Malling, 1922–34, N. H. GRUBB (*Jour. Pomol. and Hort. Sci., 13 (1935), No. 2, pp. 108–134*).—Discussing important characters in raspberries and methods of technic employed in breeding operations, the author presents data on the comparative value of different varieties as parents, both when selfed and crossed, and sets forth the characteristics of 35 families of seedlings produced at the station. In none of the selfed progenies was there found a single seedling which could be honestly said to be superior to its parent. However, the selfed seedlings were found promising as parents for the creation of new varieties, because being less heterozygous than the parents they transmitted their characters more definitely. The genetics of the inheritance of fruit color, spine color, deficiency of chlorophyll, sex, hairiness, absence of spines, and abnormal types of inflorescence are discussed. In one family, Burnett Holm selfed, 10 of 36 plants were entirely free of spines, spinelessness being apparently a simple recessive character.

[Variegation in the strawberry], Y. IMAI (*Jour. Genet., 31 (1935), No. 1, p. 57, fig. 1*).—In a paper entitled The Structure of Albomarginata and Medioalbinata Forms reference is made to a white fringing observed on the winter leaves of *Fragaria chiloensis ananassa*. Since the phenomenon did not occur in summer, the author concludes that high temperature interferes with the development of the ectohistogen. Seed collected from the affected plants gave only green seedlings.

Strawberry growing in Colorado, G. BEACH (*Colorado Sta. Press Bul. 86* (*1935*), *pp.* [8], *figs. 2*).—General information is offered on varieties, establishment of beds, cultural care, spacing of plants, propagation, harvesting, etc.

On the bearing behavior of the Fuerte avocado variety in southern California, R. W. HODGSON and S. H. CAMERON (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 200–203, figs. 2*).—Yield records taken by the University of California at Los Angeles over a 6-yr. period on 128 Fuerte trees showed a definite correlation between winter temperature and production and also between the size of the crop of any year with that of the succeeding year. Large crops were produced only in seasons following mild winters and also succeeding small or medium crops. Winters sufficiently mild to cause delayed foliation of Temperate Zone fruits, such as the peach, favored large avocado yields, particularly if the preceding crop was small.

Blossom-bud differentiation in citrus trees, C. E. ABBOTT (*Amer. Jour. Bot., 22* (*1935*), *No. 4, pp. 476–485, figs. 2*).—Examinations of buds collected at Gainesville, Fla., at frequent intervals throughout the year from Duncan grapefruit, Pineapple orange, Owari satsuma, and Nagami kumquat trees ranging in age from 14 to 24 yr. showed that differentiation does not occur until the beginning of growth in spring or following resumption of growth at any time in the year. The growth and fruiting habits in the kumquat differed in that the majority of fruit buds formed for the crop of the current season were differentiated in late May and early June on wood formed the same spring. The ringing of grapefruit, orange, and satsuma trees on March 25, when in active growth, did not increase fruit bud formation. Ringing on May 3 did increase the number of flower buds formed at the beginning of the September flush of growth.

Total nitrogen in developing flowers and young fruits of the Valencia orange, S. H. CAMERON and D. APPLEMAN (*Amer. Soc. Hort. Sci. Proc., 31* (*1934*), *pp. 204–207, fig. 1*).—Analyses of flowers and young fruits collected at frequent intervals from March 6 to June 24 from four 12-year-old Valencia orange trees showed a gradual increase in dry weight and in absolute nitrogen content of blooms and young fruits during March and April and a very rapid increase during May and June. However, on the basis of percentage of the dry weight the nitrogen content showed a slight but consistent decrease throughout the period. In full bloom, petals contained nearly 45 percent of the nitrogen of the entire flower and almost as much of the dry weight. Apparently most of the nitrogen present in the abscissing flowers is lost to the tree. The fact that an inverse relationship was indicated between the amount of bloom and the size of the resulting crop led the authors to suggest that the loss of nitrogen in the abscissing flowers and young fruits may be highly important. Blooms developing March 1 were richer in nitrogen than those opening on March 15.

The alternation of heavy and light crops in the Valencia late orange, E. S. WEST and C. BARNARD (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 2, pp. 93–100, fig. 1*).—January thinning of Valencia oranges in their heavy crop year was found, in these Australian studies, to be effective in increasing the succeeding crop. Thinning as late as March in the heavy crop year did not increase the size of the remaining fruits but did exert a marked beneficial effect on the vegetative vigor. Complete removal of the crop in the heavy fruiting year at any time up to August increased the subsequent crop. Observations on Valencia and Washington Navel buds collected at frequent intervals showed no differentiation of flower primordia until the

young shoots were about to emerge from the protection of the scales. The axillary buds differentiated a little later than the terminals, that is, when the young shoots were about 0.25 in. in length.

Date growing in Arizona, D. W. ALBERT and R. H. HILGEMAN (*Arizona Sta. Bul. 149 (1935), pp. 231–286, figs. 25*).—This comprehensive paper includes a history of date production in the United States, the botany of the date palm and flowers, temperature and humidity requirements, cost of developing plantations, propagation, planting, general management, pruning, pollination, harvesting, effect of rain on the maturing dates, processing of harvested dates, packing, storage, and varieties. Included among the tables are those giving data on the cost of bringing a date garden into production and the accumulation of sugars in the ripening fruits of the Khadrawy and Maktoom varieties.

The relation of fruiting to vegetative growth characters in Carabao mango, Mangifera indica L, F. G. GALANG and F. D. LAZO (*Philippine Jour. Agr., 6 (1935), No. 1, pp. 129–139, figs. 2*).—Observations on seedling and vegetatively propagated Carabao mango trees of various ages showed that bearing terminals as well as lateral twigs were longer and thicker than nonfruiting twigs. There were slightly more but smaller leaves on the bearing shoots.

All about tea, W. H. UKERS (*New York: Tea and Coffee Trade Jour. Co., 1935, vols. 1, pp. XVI+559, pl. 1, figs. 547; 2, pp. VIII+568, pl. 1, figs. 844*).—A comprehensive discussion dealing with the historical, technical, scientific, commercial, social, and artistic aspects.

Morphological development of the fruit of Juglans regia, C. G. NAST (*Hilgardia [California Sta.], 9 (1935), No. 7, pp. 345–362, pls. 19*).—The results are discussed of a microscopic study of the morphology and development of the pistillate flower from the first indication of differentiation of the floral parts until the development of the embryo.

Cultural methods for young pecan orchards in the irrigated Southwest, A. H. FINCH (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 56–60, figs. 3*).—Observations by the Arizona Experiment Station in the Yuma Valley showed that a sustained supply of soil moisture is important for the pecan. Of different cover crops the summer legumes, such as Hubam clover, sour clover, and sesbania, gave the best results, not only supplying organic matter but also suppressing weeds. Alfalfa reduced the shoot growth of the pecans, apparently by excessive use of the available nitrogen. Clean culture was not desirable, apparently because of insufficient nitrogen and a lack of shade.

Results of pecan cover crop experiments, G. H. BLACKMON (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 8–11*).—Records taken by the Florida Experiment Station in a mixed Frotscher and Stuart pecan orchard, set in 1908 and planted since 1928 with different cover crops, showed the benefit of legumes, particularly the winter species, Austrian peas and hairy vetch. A combination of vetch and *Crotalaria spectabilis* produced and greatest weight of green material, but the pecan yields from the Austrian pea-*Crotalaria* combination plats were slightly larger. Where nitrogen in the form of sulfate of ammonia was applied in addition to the uniform phosphorus and potassium treatments there was some increase in yields in the Frotscher but none in the Stuart variety, due apparently to its light cropping. Growth increments, as shown by the calculated area of the cross sections of the trunk, were greatest in the Austrian pea-*Crotalaria* and hairy vetch-*Crotalaria* blocks, and were notably increased, particularly in the Frotscher variety, by sulfate of ammonia.

The isolation and propagation of high pyrethrin strains of pyrethrum, B. D. DRAIN and G. A. SHUEY (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 190, 191*).—Marked variability in pyrethrin content (ranging from 0.51 to 2.05 per-

cent) observed in the dry flowers of pyrethrum seedlings led to a study at the Tennessee Experiment Station of methods of asexual propagation. Crown division in autumn was found most promising, and certain of the larger and more easily propagated plants yielded over 100 divisions. Analyses of the flowers of vegetatively increased plants showed a definite correlation of pyrethrin with that of the parent plant, suggesting that pyrethrin content is more or less a genetic factor.

Everyman's garden, M. SCHLING (*New York: Macmillan Co., 1935, pp. VIII+106, pls. 8, fig. 1*).—A narrative account is presented of the different steps in the development and improvement of a small suburban place.

The book of annuals, A. C. HOTTES (*New York: A. T. De La Mare Co.; Toronto: Gen. Pub. Co., Ltd., 1935, 3. ed., rev., pp. VIII+171, pl. 1, figs. 74*).—A small handbook of varietal and cultural information.

Diseases and insect pests of Rhododendron and Azalea, R. P. WHITE and C. C. HAMILTON (*New Jersey Stas. Circ. 350 (1935), pp. 23, figs. 2*).—In connection with discussions of symptoms and control of various pests, there is presented a spray schedule, which, with slight indicated modifications, is said to be adapted to both groups of plants. The importance of maintaining an acid reaction in soil used for growing both species is stressed.

Old roses, MRS. F. L. KEAYS (*New York: Macmillan Co., 1935, pp. XI+222, pls. 16, figs. 21*).—Descriptive and historical information is presented on various roses of the old-fashioned garden.

FORESTRY

Some American trees, W. B. WERTHNER (*New York: Macmillan Co., 1935, pp. XV+398, pl. 1, figs. 264*).—Grouping trees by botanical families, the author discusses the native forest species of Ohio in nontechnical language.

The hemlock-white pine-northern hardwood region of eastern North America, G. E. NICHOLS (*Ecology, 16 (1935), No. 3, pp. 403–422, figs. 9*).—Based on extended field observations in the eastern hemlock region, essentially a mesophytic forest comprising a mixture of evergreen coniferous and deciduous broadleaf species, the author proposes a division of the area into four general groups according to important climax species. These groups are as follows: (1) Balsam fir and white spruce, (2) hemlock, eastern white pine, and yellow birch, (3) sugar maple and basswood, and (4) beech and white ash. The entire area, often considered a part of the northern conifer forest region, is considered by the author to be much more closely related to the deciduous forest, which it particularly resembles in the prominence of trees in groups 3 and 4. The desirability of treating the general area as a distinct ecological unit is suggested.

Fire as a necessary factor in the perpetuation of white pine, D. K. MAISSUROW (*Jour. Forestry, 33 (1935), No. 4, pp. 373–378*).—Studies in Pontiac County, Que., led the author to suggest that during the period 1850 to 1930 the bulk of the reproduction of white pine was confined to burned-over areas. Arranged in order of importance in promoting white pine regeneration are forest fires, erosion, inundation, and wind. A survey of older stands led to the conclusion that the same factors prevailed. The author believes that the rapid disappearance of white pine is not the direct result of forest fires or logging but is the result of disturbing the balance between the seed bearing capacity of the forest and the frequency or destructiveness of forest fires.

[Forest tree trials at the North Platte Substation] (*Nebraska Sta. Rpt. [1934], p. 32*).—The results of variety tests on different soil types are briefly discussed.

Numbering trees on permanent sample plots with rubber stamps and paint, H. F. Morey and P. W. Stickel (*Jour. Forestry, 33 (1935), No. 4, pp. 422–425*).—The technic of marking trees by stamping is described, together with a discussion of the advantages and disadvantages of this method.

Relation of sunlight to rate of growth, G. A. Pearson (*Jour. Forestry, 33 (1935), No. 6, pp. 630, 631*).—In experiments conducted by the Southwestern Forest and Range Experiment Station of Tucson, Ariz., with ponderosa pine grown under lath shades, there was observed a sharply reduced diameter growth but even where insolation was cut in half height growth was only slightly reduced. Pines planted in 10 percent of full insolation all died during the first winter. In 20 percent light more than one-half died, and the survivors at the end of 5 yr. were much below normal.

Growth and its relation to thinning: Sample plot studies in mixed hardwood stands, C. H. Guise (*Jour. Forestry, 33 (1935), No. 4, pp. 419–421*).—The fourth 5-yr. measurement (E. S. R., 62, p. 844) of plats established by Cornell University in 1914 near Mapleton, N. Y., showed that the stimulation of growth due to the original thinnings was decreasing. With the basal area in the control plat as 100 percent, the heavily thinned and the lightly thinned plats were found to be 86 and 80 percent, respectively. In the thinned plats the mean annual increment was greatest in the second and third 5-yr. periods. Due to more rapid growth and lower mortality in the thinned plats, the volumes at the end of 20 yr. were 90 and 85 percent, respectively, of the control as compared with 57 and 62 percent immediately after thinning.

Buckwheat as an indicator of the relative nitrogen requirement of conifers, E. J. Eliason (*Jour. Forestry, 33 (1935), No. 6, pp. 628, 629*).—At the Saratoga Nursery of the New York Conservation Department, Japanese buckwheat sown over an area from which young nursery forest trees had just been removed showed distinct color variations correlated with the species of trees; for example, following white cedar the buckwheat was distinctly yellow, whereas following white and red pines the color was normal green. Applications of nitrate of soda quickly restored the normal green color.

Forest nursery seedlings subject to arsenical injury in some soils, R. A. St. George (*Jour. Forestry, 33 (1935), No. 6, pp. 627, 628*).—As determined in forest tree nurseries in Nebraska and in the Carolinas, injury to young seedlings and transplant stock may result from treating the soil with arsenate of lead or white arsenic to control white grubs. The arsenic also affected adversely the germination of forest seeds. In certain soils the injury was not manifest the first year but persisted thereafter for several years.

Results of 1924 cleanings of cove hardwoods, Pisgah National Forest, C. A. Abell (*Jour. Forestry, 33 (1935), No. 6, pp. 626, 627*).—Data taken on plats established in a young cove hardwood stand, following an improvement cutting in 1924, showed 10 yr. later an increase of 143 desirable dominant trees per acre as compared with 89 in an adjacent untreated area. In addition to the greater number of desirable trees, the cleaned plats showed better diameter growth.

A visibility meter for forest fire lookouts, R. C. McArdle (*Jour. Forestry, 33 (1935), No. 4, pp. 385–388, figs. 2*).—Herein is discussed the construction and operation of a new instrument known as a haze meter, designed for the use of lookouts in obtaining accurate information as to the visibility.

Experience with hazard indicator sticks, D. N. Matthews (*Jour. Forestry, 33 (1935), No. 4, pp. 392–397, figs. 2*).—Studies with sample sticks of Douglas fir, Sitka spruce, western hemlock, northern black cottonwood, sapwood of ponderosa pine, and certain other species indicated that whereas in dry weather

there is very little variation in moisture content between individual pieces or even between species, in wet weather the individuals exhibited considerable variation, due apparently to difference in grain, texture, source of material, etc. The size and preparation of standard sticks are discussed.

A country-wide forest fire weather hazard index, E. W. Loveridge (*Jour. Forestry, 33 (1935), No. 4, pp. 379–384, fig. 1*).—Discussing the development and use of a single index of precipitation conditions for the country as a whole, the author points out the need of considering the effect of surpluses and deficiencies in precipitation over extended periods for gaging the degree of fire hazards rather than relying solely on current or short term weather conditions.

A measure of forest fire hazard in central Idaho, H. M. Shank (*Jour. Forestry, 33 (1935), No. 4, pp. 389–391, fig. 1*).—A method of estimating forest fire hazards is described which makes use of cumulative excesses and deficiencies of relative humidity with reference to a previously established basal humidity.

DISEASES OF PLANTS

[Plant disease studies in Massachusetts] (*Massachusetts Sta. Bul. 315 (1935), pp. 16, 17, 23–26, 32–34*).—The results of work during 1934 are summarized on testing and selection of tobacco varieties and strains for resistance to black root rot [*Thielavia basicola*], by C. V. Kightlinger; spraying and soil treatment against downy mildew of cucumber (*Peronoplasmopara cubensis*) and spraying and selection for resistance against lettuce downy mildew (*Bremia lactucae*) and soil treatments against damping-off diseases of herbaceous ornamental plants, both by W. L. Doran; hot water treatment against seed-borne eggplant wilt (*Verticillium alboatrum*), testing tomato variety crosses and crosses between tomato and *Lycopersicum pimpinellifolium* for resistance to the leaf mold *Cladosporium fulvum*, dry chemical seed treatments of vegetable seed, causes and control by the use of formaldehyde gas and other materials of decay of winter squash in storage due to cucurbit wilt (*Bacillus tracheiphilus*) and other organisms, the testing of carnation varieties for resistance to carnation blight (*Alternaria dianthi*) and soil treatment against *Alternaria* and *Fusarium* infection of carnation cuttings, and spraying with sulfur-containing fungicides against apple rust (*Gymnosporangium juniperi-virginianae*), all by E. F. Guba; development of strains of cranberry resistant to false blossom, oxygen content of flooding water in relation to cranberry vine injury, cranberry spraying and dusting experiments, and development of rots in storage on cranberries subjected to various field and storage treatments, all by H. F. Bergman and W. E. Truran; regeneration of bogs infected with cranberry false blossom by spraying with sodium arsenite, by Bergman; and studies on production and dispersal of spores of fungi causing cranberry fruit rots, by Bergman and M. S. Wilcox.

[Plant disease studies in Rhode Island] (*Rhode Island Sta. Rpt. [1934], pp. 68, 74–76*).—Brief reports are given of the results of a comparison of different fungicides in relation to apple scab control and spray injury, vegetable seed treatments for the control of damping-off, field spraying of tomatoes with bordeaux mixture and copper-lime dust for the control of early and late blights, field spraying with bordeaux mixture to control early and late blights of celery, a comparison of commercial compounds for the control of brown patch and dollar spot of bentgrasses, and the control of pink patch (*Corticium fusiforme*) of golf courses with mercury.

[Plant disease investigations at the Experimental and Research Station, Cheshunt, England] (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpt., 19 (1933), pp. 39–68, 98–100, figs. 5*).—Brief reports are included of work conducted

on leafy gall of chrysanthemum, by P. H. Williams; on rose diseases, by W. F. Bewley and O. B. Orchard; on the sterilization of lettuce seed, *Botrytis* rot, gray mold, or wilt of lettuce, bean wilt (cause uncertain), and rhubarb disease (a hitherto unreported vascular dry rot), all by H. L. White; on spotted wilt of tomato, mosaic diseases of the cucumber (cucumber viruses 3 and 1), the effects of manures on tomato plants infected with aucuba mosaic, and an experiment with seeds from "streaked" tomato plants, all by G. C. Ainsworth; on physiological investigations of mosaic disease of the tomato, by W. H. Read; on the control of leaf mold of tomatoes by vaporization of sulfur and fumigation with quinone, by O. B. Orchard and W. H. Read; and on plant injury (due to drip of soluble zinc sulfate from wires and zinc-painted frames) following the burning of sulfur in glasshouses, by W. H. Read, and O. B. Orchard.

The effect of magnesium deficiency on crop plants, A. B. Beaumont and M. E. Snell (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 6, pp. 553–562, figs. 4*).—In tests extending from 1929 to 1934, 20 crop plants were grown in the field at the Massachusetts Experiment Station in soil moderately deficient in available magnesium. It was found that the crops differed to a marked degree in their reaction to the deficiency as indicated by growth and physiological symptoms. Buckwheat and spinach were most, and turnips, mangels, corn, and potatoes considerably, affected by the deficiency. The small grains, grasses, clovers, and potatoes were slightly affected, but onions, alfalfa, and Japanese millet showed no effect.

The older leaves of affected plants showed chlorosis, which in some cases developed into necrosis, in the intervascular tissue. Leaves with parallel veins developed striped, and those with netted veins mottled, chlorotic patterns. In severe cases of chlorosis the margin of the leaf turned brown, and in some cases the leaf dropped from the plant. The percentage of magnesium was found to be less in plants grown on soil deficient in available magnesium than on that not deficient. Heavy rainfall during the growing season decreased the amount of available magnesium in the soil as indicated by yield, plant symptoms, and chemical composition of the plant.

Filtrability of certain plant pathogenic bacteria, P. A. Ark (*Phytopathology, 25* (*1935*), *No 7, fig. 728, 729*).—Filtration of skim milk cultures of *Erwinia amylovora* after 7, 12, 24, and 36 days, respectively, showed that the particles constituting a filtrable form of the fire blight organism can pass through Berkefeld "V" and "N" and Chamberland "L_5" filters. Filtrability of *E. carotovora* also was demonstrated under similar conditions at the University of California. Filtrates of bouillon cultures of both organisms remained sterile.—(*Courtesy Biol. Abs.*)

Aeciospore infection in Gymnoconia interstitialis by penetration of the cuticle, S. M. Pady (*Phytopathology, 25* (*1935*), *No. 5, pp. 453–474, pls. 2, figs. 5*).—In studies with abundant material from a number of sources, the entrance of the aeciospore germ tubes of the orange rust of *Rubus* was found to be an exception to the general rule of stomatal penetration. Appressoria are formed at the ends of the germ tubes, and the entire contents of the aeciospore enter—the two nuclei divide once so that the mature appressorium is 4-nucleate. A penetration peg passes through the cuticle and cell wall, and a short hypha is formed in the epidermal cell. The inner wall of the host cell is then penetrated, and the hypha enters an intercellular space just below. The mycelium spreads rapidly in the leaf tissue, and haustoria may be observed after 5 days. Teliospores were formed from 21 days on. The results of a series of inoculations indicate that penetration takes place equally well through the upper

stoma-free surface and on the lower stoma-bearing surface of leaves of either the blackberry, the black raspberry, or the dewberry.—(*Courtesy Biol. Abs.*)

Nonsterile soil leachate stimulating to zoosporangia production by Phytophthora sp., F. P. Mehrlich (*Phytopathology, 25 (1935), No. 4, pp. 432–435*).—Mycelium of *P. cinnamomi* grown on malt broth, washed subsequently in distilled water, and incubated in nonsterile soil leachate at from 21° to 25° C. gave a consistent, abundant production of papillate zoosporangia.

Sterilization of the leachate by steam greatly inhibited sporangium production, as did the substitution of sterile distilled water, Petri's solution, or M/100 KNO_3. Inoculation of Petri's solution with a trace of nonsterile leachate stimulated the production of zoosporangia in it.—(*Courtesy Biol. Abs.*)

Comparative studies of certain cultures of Puccinia rubigo-vera and Puccinia tomipara on wild grasses, G. W. Fischer (*Phytopathology, 25 (1935), No. 7, pp. 657–685, figs. 3*).—At the State College of Washington nine physiologically distinct cultures of *P. rubigo-vera* on wild grasses were studied with regard to their reaction on different collections within species of wild grasses in an effort to obtain information concerning the extent to which the physiologic specialization of races of leaf rust of wild grasses is comparable to that of leaf rust of cereals.

Eight of the cultures were specialized to different grasses of the tribe Hordeae, and one was restricted to a few species of *Bromus*. Forty-six collections of species and varieties of *Elymus, Agropyron, Hordeum*, and *Hystrix* were inoculated with these eight cultures. Replicate sets of these grasses were used—one set for each culture.

On the basis of results of repeated inoculations, the following conclusions were reached: (1) None of the cultures of *P. rubigo-vera* studied could be identified with any of the 56 races of this rust species established by previous investigators, and no attempt was made to establish new races; (2) marked intraspecific reactional differences were noted for the various collections of wild grass species when inoculated with any one of the several cultures of leaf rust; (3) physiologic specialization in the leaf rust of wild grasses presents a situation quite comparable to that of the same rust on cereals; and (4) interpretation of the results of culture work with races of *P. rubigo-vera* on various wild grasses should at least involve a consideration of the intraspecific reactional differences between collections of wild grass species.

Biometrical studies of the urediospores and teliospores showed that certain cultures differ rather markedly in the mean dimensions of the spores. Cultures having the smallest urediospores do not necessarily have the smallest teliospores. Attempts to correlate spore size with aecial host specialization were unsuccessful.

A single culture of *P. tomipara* was also studied critically, with attention to the question of genetic fixity in the multicellular character of the teliospores. Though the culture was carried through two aecial generations, the percentage of multicellular teliospores showed no decrease, remaining approximately 95 percent. *P. tomipara* is, therefore, a valid species and not merely a teratologic race of *P. rubigo-vera*.—(*Courtesy Biol. Abs.*)

The effect of light on the initiation of rust infection, H. Hart and I. L. Forbes (*Phytopathology, 25 (1935), No. 7, pp. 715–725, fig. 1*).—Cooperative investigations between the U. S. D. A. Bureau of Plant Industry and the Minnesota Experiment Station were carried out to determine the effect of light and of darkness during the incubation period (period in the moist chamber) on the prevalence and severity of infection of *Puccinia triticina, P. graminis tritici, P. coronata, P. sorghi, P. helianthi, P. antirrhini*, and *Uromyces appendiculatus*.

To determine the effect of darkness, plants were usually kept in darkness several hours prior to inoculation and then in dark moist chambers from 12 to 24 hr., and occasionally for 72 hr. Comparable series were incubated under natural conditions of alternating daylight and darkness. The prevalence and severity of infection by *P. graminis tritici* and *U. appendiculatus* were considerably reduced as a result of incubation in darkness. There also was a perceptible, but less pronounced, effect on *P. sorghi* and *P. helianthi*. Darkness did not reduce the prevalence of infection by *P. coronata*, nor did it reduce the severity on Gopher oats, but on Victory oats it caused a slight reduction in severity. The effect of darkness on infection by *P. graminis tritici* varied somewhat with the wheat variety and with the physiologic form of rust. The infection of the susceptible wheat variety Marquis was decidedly less on plants incubated in darkness than on those incubated in the light, but the difference on the resistant variety Marquillo was less pronounced. There were no appreciable differences in the prevalence and severity of infection on plants inoculated with *P. triticina* and *P. antirrhini* and then incubated in darkness or in light.

It is concluded that darkness is unfavorable to infection with some rusts, but has no effect with others. The results would, therefore, indicate that moisture is the most important factor for infection with some rusts, but that light must also be taken into consideration with others.—(*Courtesy Biol. Abs.*)

The antigenicity of the plant viruses, K. S. Chester (*Phytopathology*, *25* (*1935*), *No. 7, pp. 702–714, figs. 4*).—The findings of H. P. Beale and of Birkeland (E. S. R., 71, p. 202), respectively, that within the Solanaceae the tobacco mosaic precipitin reaction is independent of host species and that purified tobacco-mosaic virus retains its specific precipitin reactivity are confirmed. The latter finding is extended by the use of additional methods of purification.

When tobacco mosaic, tobacco ring spot, potato vein-banding, and potato ring spot viruses are inactivated by series of progressive strengths of chemicals, or by progressive degrees of heating, and when tobacco-mosaic virus is inactivated by progressive changes of pH, or progressively fractionated by filtration, in each case the seric reactions are retained as long as the virus is present and active. They diminish in strength in a way closely parallel to the progressive loss in infectivity, and they disappear at the point at which the virus becomes no longer demonstrable.

When tobacco mosaic virus and potato latent mosaic virus immune sera are tested with their respective viruses propagated in hosts distinctly removed systematically from the hosts used in serum preparation, the seric reactions are demonstrable, correlated with the amount of infective material, and independent of the host plants used.

From these findings, as well as from the facts previously reported concerning virus neutralization, the possibility of arriving at a logical classification of viruses by means of serological reactions, and the correlation between strength of serological reactions and the amount of infective material present in test samples, it is concluded that the evidence now available warrants the assumption that the antigens responsible for the plant virus serological reactions thus far studied are the viruses themselves and not normal or derived constituents of diseased plants.—(*Courtesy Biol. Abs.*)

A virus of crucifers and other hosts, I. A. Hoggan and J. Johnson (*Phytopathology*, *25* (*1935*), *No. 6, pp. 640–644, figs. 2*).—From studies at the Wisconsin Experiment Station, a description is given of a crucifer-mosaic virus, affecting various cruciferous and other hosts and transmissible by plant extract and

more readily by aphids (*Myzus persicae* and *Brevicoryne brassicae*). The thermal death point was determined as 54° C. (10 min.), the tolerance to dilution 1:1,000, and the longevity in vitro at about 20°–22°, from 24 to 48 hr. Characteristic symptoms are produced on tobacco, consisting of conspicuous necrotic local lesions without systemic invasion. It is unknown whether this virus is identical with the crucifer-mosaic viruses reported by other investigators.—(*Courtesy Biol. Abs.*)

The relation of time to the effect of bordeaux mixture on transpiration, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 174 (1935), pp. 120–124, figs. 2*).—Continuing work previously referred to (E. S. R., 71, p. 785; 72, pp. 198, 790), the authors used coleus, a plant highly sensitive to the influence of bordeaux mixture on transpiration. "When either cut shoots . . . attached to burettes or plants growing in 0.5-gal tinned cans were treated with bordeaux mixture, they showed a marked increase in transpiration immediately following the time the spray material became dry. In many instances the increase in transpiration brought about by the application of bordeaux mixture to coleus plants became greater each night for at least 4 successive nights. In an experiment designed to study the influence of bordeaux mixture on the transpiration rate over a period longer than 4 days, the maximum increase occurred on the fourth night after the plants were sprayed regardless of whether newly prepared material or some 4 days old was used, but the latter material did not cause as great an increase as the former. The decrease in effect was rapid from the fifth to the eighth night after spraying but was more gradual from the ninth to the twelfth night. However, the bordeaux mixture was still effective in causing the treated plants to lose more water than the untreated checks during the twelfth night after it was applied." No report is given on the effect on transpiration during the daytime in relation to the lapse of time.

The use of sodium hypochlorite solutions as disinfecting agents in horticulture, G. A. Huber (*Better Fruit, 29 (1935), No. 12, pp. 5, 6*).—Tests were conducted at the Western Washington Experiment Station to determine practicable means of killing the spores of bulb-rotting fungi on trays used in bulb storage. Wooden blocks cut from wooden bulb trays were contaminated artificially with spores of different species of fungi belonging to 12 genera. The blocks were then dried, treated in the solutions under trial, and tested to determine the proportion of living spores which remained.

Spores of *Botrytis narcissicola*, which causes "smoulder" of narcissus, were killed by immersing contaminated blocks for 3 sec. at 60° F. in a commercial sodium hypochlorite product (testing 79.5 g of available Cl per liter) diluted with tap water at the rate of 1–500. The spores of other fungi proved more resistant, but soaking for 1 min. in strengths of 1–100 and 1–50 killed all except those of *Penicillium expansum*. The spores of the latter, though considerably reduced in viability, were not completely killed by 5 min. at 1–500 strength. When the temperature was raised to about 107° (42° C.), a 3-sec. dip in a strength of 1–100 killed all spores except those of *P. expansum*, while a 1-min. soak gave complete killing.

In large-scale tests continuous action of the solution made it impossible to use a wooden tank, and a galvanized iron container treated with asphaltum paint was employed. Practically 100 percent killing of *P. expansum* spores was obtained with the 10-sec. dip at from 106° to 108° F. and 1–100 strength. Two other commercial products containing small amounts of sodium hypochlorite were tested. At 60° with 1-min. soak in 1–100 strength less than 1 percent of the spores of *P. expansum* survived treatment with the first product,

while the other apparently proved more active and gave practically 100 percent killing. The author holds that this type of disinfecting material deserves further consideration and study.

Wojnowicia graminis as a very weak, secondary parasite of winter cereal crops, R. SPRAGUE (*Phytopathology, 25 (1935), No. 4, pp. 405–415, figs. 2*).—The results of studies made in Washington and Oregon are reported which indicate that *W. graminis* is a species with a number of physiologic forms or strains, with some variation in morphological characteristics, and that it is very weakly pathogenic on a number of cereals and grasses. In Washington and Oregon it is usually found associated with the active parasite *Cercosporella herpotrichoides*.—(*Courtesy Biol. Abs.*)

Field trials on control of wheat stinking smut by dust fungicides, J. H. MUNCIE and C. W. FRUTCHEY (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 189–192*).—Seed wheat was artificially and uniformly smutted by shaking for 5 min. with an excess of spores of *Tilletia laevis*, after which the excess smut was removed by screening. The individual lots were then shaken up in a tight container with the various dust fungicides applied at the rate of 3 oz. per bushel of grain and kept in closed paper bags for from 48 to 72 hr. before planting. The tests were repeated in early October over a period of 3 yr.

The results are averaged in a table. Forty-three different materials or combinations were tested. The untreated smutted checks averaged 37.8 percent smut. The highest ranking dust was one that contained 5 percent ethanol mercury chloride and gave an average of 0.21 percent smut. In all, 11 different materials, including paris green, several ethyl mercury dusts, and copper carbonate, gave less than 1 percent smut on the average in these tests.

Relation of soil acidity to a seedling disease of alfalfa on three Iowa soils, W. F. BUCHHOLTZ (*Phytopathology, 25 (1935), No. 4, pp. 421–425, fig. 1*).—In studies at the Iowa Experiment Station it was found that species of *Pythium* attacked germinating, emerging, and young growing seedlings of alfalfa on three acid Iowa soils in greater numbers and with more severity than on two similar neutral soils. The same type of disease was found in the field on sugar beets, other legumes, and flax. At 9° C. young alfalfa and alsike seedlings damped-off less in acid soil (pH 6.2) than at 20° to 25°. Damping-off was inhibited in alfalfa by a generous application of limestone to the acid soil and in sugar beets by dusting the seed with hydrated lime.—(*Courtesy Biol. Abs.*)

Ascochyta boltshauseri on beans in Oregon, R. SPRAGUE (*Phytopathology, 25 (1935), No. 4, pp. 416–420*).—*A. boltshauseri* was collected on *Phaseolus vulgaris* in Oregon in 1932, which is apparently the first report of the organism from North America. Cross inoculations showed that it is distinct from other legume-infesting species of *Ascochyta*. *Stagonopsis phaseoli* Eriks. is considered a synonym of *A. boltshauseri*. The morphologic characters are described. Inoculation tests showed it to be pathogenic not only on *P. vulgaris* but also on *P. aureus*, *P. angularis*, and *P. coccineus*.—(*Courtesy Biol. Abs.*)

An internal necrosis of bean seeds, C. R. ORTON and W. D. HENRY (*Phytopathology, 25 (1935), No. 7, pp. 726–728, fig. 1*).—A sample of the Wooster Mammoth variety was received in the spring of 1934, which showed, in a high percentage of the seeds, brown necrotic spots in the center of the flat inner surface of both cotyledons. The disease was present but less evident in the variety Jarvis, which occurred as a mixture in the sample. Plantings of affected seeds resulted in the production of internal necrosis in 96 percent of the pods produced by Wooster Mammoth and in about 20 percent by Jarvis. Since isolation tests at the West Virginia Experiment Station gave negative results, the dis-

ease appears to be nonparasitic unless a virus is concerned. However, there may be heritable tendencies influencing its incidence. It bears a close resemblance to the "marsh spot" of peas.—(*Courtesy Biol. Abs.*)

Fusarium yellows of celery, T. C. RYKER (*Phytopathology, 25 (1935), No. 6, pp. 578–600, figs. 7*).—In studies conducted at the University of Wisconsin, isolates from two localities in Wisconsin agreed in pathogenicity with one from Michigan, but there were differences in the degree of virulence and in certain culture characters. The seed lots used consisted of the susceptible Golden Self-Blanching variety and of certain resistant strains.

Environmental and pathogenicity studies were carried out in Wisconsin soil-temperature tanks. All isolates were pathogenic on Golden Self-Blanching, but they showed differences in the degree of virulence. In the greenhouse two types of chlorosis were induced, depending on the isolate used. The several isolates showed essentially the same temperature relations when grown on potato dextrose agar held at various constant temperatures. The extremes of growth were close to 8° and 36° C., with optimum at about 28°. When Golden Self-Blanching was grown at various constant soil temperatures, good growth occurred at from 18° to 28°, with marked stunting above 28°. Disease developed in this variety at soil temperatures from 18° to 32°. The incubation period was shortened proportionately with the increase of temperature up to 28°.

Soil temperatures affected the resistance of certain varieties. Michigan Golden Self-Blanching was highly resistant only up to 18°, Winter Queen and Curly Leaf Easy-Bleaching were highly resistant up to 26°, while the Michigan Golden variety was completely resistant with all strains and at all temperatures tested. Celery grown in noninfested and in infested soils held at 50 to 70 percent of the water-holding capacity showed retarded host development and slower disease development at the lower soil moisture.

Monoconidial cultures derived from several of the isolates varied in cultural characters and in virulence but were of the same symptom type as the parent isolate. Continued subculturing tended to produce constancy in cultural characters but not in virulence.—(*Courtesy Biol. Abs.*)

The host range of the southern celery-mosaic virus, F. L. WELLMAN (*Phytopathology, 25 (1935), No. 4, pp. 377–404*).—Inoculation experiments, supplemented by symptom studies and field observations, have demonstrated that the southern celery-mosaic virus (celery virus 1) may infect at least 91 different species and varieties (4 families of monocotyledons and 19 families of dicotyledons), of which 46 have been found naturally infected in the field. In addition, 146 species were tested and found apparently nonsusceptible. Extreme variability in symptoms was noted. Primary lesions resulted in certain cases from both aphid and rubbing methods of inoculation—systemic infection did not always follow primary-lesion development. Severe necrosis, stunting, yellowing, mottling, and distortion developed on some hosts, while in others these symptoms were mild or lacking. In some cases infected leaves were dropped, which precluded systemic disease, and masked carriers were noted in certain species. Some important plants found susceptible were celery, corn, cucumber, pepper, spinach, squash, sweetpotato, marigold, Floras paintbrush, larkspur, periwinkle, petunia, zinnia, *Physalis*, pokeberry, ragweed, wild wandering-jew, broadbean, banana, sorghum, tobacco, wheat, and rye.—(*Courtesy Biol. Abs.*)

Cotton diseases and methods of control, D. C. NEAL and W. W. GILBERT (*U. S. Dept. Agr., Farmers' Bul. 1745 (1935), pp. II+34, figs. 27*).—This bulletin is a revision of and supersedes Farmers' Bulletin 1187 (E. S. R., 45, p. 246.)

The major diseases of cotton in the United States are described in popular form and illustrated, and the best known methods of control are discussed. The diseases dealt with are root rot (*Phymatotrichum omnivorum*), *Fusarium* wilt (*F. vasinfectum*), *Verticillium* wilt (*V. alboatrum*), root knot (*Heterodera marioni*), anthracnose (*Glomerella gossypii*), bacterial blight (*Bacterium* (*Phytomonas*) *malvacearum*), rust (due to unfavorable soil conditions or potash deficiency), crazy top (acromania) (cause unknown), magnesium deficiency, sore shin (damping-off) (*Corticium vagum*), *Ascochyta* blight (*A. gossypii*), and lightning injury. The minor diseases are leaf blight (*Alternaria* sp.), leaf spot (*Cercospora gossypina*), frosty blight or areolate mildew (*Ramularia areola*), true rusts (*Kuehneola gossypii* and *Puccinia hibisciata*), *Diplodia* boll rot (*D. gossypina*), and other boll rots (chiefly *F. roseum* and *F. moniliforme*, *Aspergillus niger*, and *Rhizopus nigricans*).

A new canker of hops in Oregon, G. R. Hoerner and D. C. Smith (*Phytopathology, 25 (1935), No. 4, pp. 437–439, fig. 1*).—First observed on June 19, 1934, near the Oregon Experiment Station, the disease was found on the leading hop varieties in western Oregon, appearing as late as September 5. Rarely leaf petioles, occasionally the tips, and commonly the internodes of untrained shoots arising from the crowns of otherwise healthy plants were affected, usually at points of contact with the soil. Yellow to light brown discolored areas developed, usually turning dark, involving the entire shoot for several inches, and often exuding clear drops, turning amber, during bright hot days. Cankered areas completely wilt and dry up, causing death of the shoot beyond. Smears of the exudate on agar slants in most instances gave apparently pure cultures of bacteria which are to be further studied.—(*Courtesy Biol. Abs.*)

Breeding millet resistant to smut in north China, C. Tu and H. W. Li (*Phytopathology, 25 (1935), No. 6, pp. 648, 649*).—Millet (*Chaetochloa italica*), second only to wheat as a food crop in north China, is seriously injured by kernel smut (*Ustilago crameri*). With a view to the development of resistant strains, 1,430 head selections made in the fall of 1932 were sown the following season after thoroughly dusting the seeds with smut spores. Striking differences in susceptibility among these selections resulted. Infection ranged from 0 to 87 percent, 192 selections remaining free of the disease and 80 proving more susceptible than the unnamed control variety used. Some of the smut-free selections also possessed desirable agronomic characters.

Blight of peppers, E. W. Bodine (*Colorado Sta. Press Bul. 85 (1935), pp. [8], figs. 5*).—This bulletin describes for the benefit of growers the destructive blight of peppers due to *Phytophthora capsici* (E. S. R., 52, p. 349). The most serious effects are due to the girdling of the stem at the soil line, with subsequent wilting and death. Leaves and green pods are attacked, but pods that have turned red show a marked resistance to infection. The disease is soil borne and to some extent seed borne in seeds from diseased pods. It may be spread by irrigation water.

Ruby King and California Wonder were found to be the most susceptible pepper varieties observed in 1931. No resistant varieties were found among 61 tested. Eggplant and tomato are also reported to be susceptible. The use of clean seed, or seed stocks, of sterilized or disease-free seedbed soil, removal of diseased plants when first discovered, and spraying with a fungicide, such as bordeaux, are suggested as control practices.

A contribution on the question of potato degeneration [trans. title], W. Dix (*Landw. Jahrb., 80 (1934), No. 5, pp. 769–809, figs. 8*).—The results are presented of investigations relating to a severe type of potato degeneration met with at Kiel and characterized by glassiness of the tubers, production of small

tubers on the sprouts, and crinkling or bouquet disease of the tops. The author concludes that storage of tubers at relatively high temperatures under conditions conducive to oxygen deficiency may result in anaerobic respiration and the production of alcohol in the tissues, with a consequent loss of vitality not directly related to the presence of any virus.

Mites on potatoes, D. Reddick (*Phytopathology, 25 (1935), No. 6, p. 654*).—A serious disease of potatoes in greenhouse culture, here shown to be due to *Tarsonemus latus*, is described. Injury of plants in the field has not been observed. *Phaseolus vulgaris* and *Pyrus malus* were severely injured in greenhouse culture by the same mite.—(*Courtesy Biol. Abs.*)

Separation of one component of potato rugose mosaic by pH difference, M. E. Freeman (*Science, 82 (1935), No. 2118, p. 165*).—In experiments at the Maine Experiment Station juice from rugose mosaic potato plants was applied mechanically to tobacco plants after its adjustment to different pH values by means of dilution with citrate or phosphate buffer solutions. With the pH 3.6 or less, no infection occurred. At a range of from pH 4.0 to 5.5, only the latent mosaic appeared. From pH 5.6 to 7.6 rugose mosaic resulted, and at pH 9.7 only the latent mosaic was transmitted. Borate ions exhibited a marked toxic effect on the components, while citrate and phosphate ions showed little difference, if any, in their specific toxicity at concentrations less than 0.1 N.

Types of potato virus diseases in North Dakota, W. E. Brentzel (*North Dakota Sta. Bul. 282 (1935), pp. 23, figs. 12*).—This bulletin popularly describes and illustrates the characteristics of the following potato virus diseases which have been recognized in North Dakota: Spindle tuber, rugose mosaic, mild mosaic, crinkle mosaic, leaf-rolling mosaic, leaf roll, interveinal mosaic, mottled curly dwarf, unmottled curly dwarf, and witches'-broom.

In a test it was found that, starting in 1928 with seed stocks free from spindle tuber, this disease increased in the stock under North Dakota conditions until in 1930 95 percent of the plants showed definite symptoms in the field, and the yield was reduced to approximately 75 percent of an average crop. It was also found that in the Bliss Triumph variety the loss following infection with crinkle mosaic may be as high as 50 percent or more.

Practical suggestions for the control of potato virus diseases are given.

Relation of virus diseases to potato production in California, D. R. Porter (*California Sta. Bul. 587 (1935), pp. 32, figs. 19*).—This report was prepared primarily for the California potato seed grower but contains summarized results of experiments conducted by the station from 1929 to 1933, chiefly with the White Rose (Wisconsin Pride) variety. A discussion is given of the nature, symptoms, and methods of dissemination of the chief potato virus diseases met with in California: Mild mosaic, crinkle mosaic, leaf-rolling mosaic, rugose mosaic, calico, leaf roll, spindle tuber, witches'-broom, and giant hill.

Tests conducted in various coastal and interior localities in the State showed that the symptoms of certain virus diseases, particularly those in the mosaic group, are masked at air temperatures above 70° F. Thus at Davis, where sister seed pieces from diseased tubers were planted in early March, early May, and late June, characteristic symptoms of mild mosaic, crinkle mosaic, leaf-rolling mosaic, rugose mosaic, calico, and leaf roll were usually evident during March, April, and early May in the March-planted stock. With increasing temperatures, however, the symptoms of mild mosaic often disappeared, and the mottling of crinkle and leaf-rolling mosaic often became masked, while the crinkling and leaf-rolling symptoms persisted. With May-planted stock mottling could usually be detected in early June for 4 or 5 hr. after sunrise, becoming masked before noon. With June-planted stock mottling could seldom be detected except in

calico, but crinkling, leaf rolling, and rugosity were often evident, and leaf roll symptoms were continually manifest.

In tests on the cumulative effects of indexing California-grown seed stocks and planting in successive years only healthy tubers in increase plats located in interior California, the percentage of healthy plants rose from 26.8 in 1930 to 86.4 in 1933.

In tests repeated in different years on the rate of spread of individual virus diseases in special plats planted in early April at Davis, Stockton, and Santa Clara, and on the effects on subsequent yield at Davis of the progeny of these plats, the average percentage of infection which developed in the healthy plants was 29.1 for mild mosaic, 47.1 for crinkle mosaic, 59.6 for rugose mosaic, and 69.3 for leaf roll, while the extent of spread and consequent reduction in the yield of the progeny was consistently least at Santa Clara and greatest at Stockton.

In tests on the influence of time of planting on the natural increase of virus diseases in clean stocks, it was found that stocks planted late (June 15 to July 1) in interior California produced much higher yielding progeny than stocks planted earlier in the spring, due in large part to the fact that while aphids are extremely active and numerous during March, April, and May, they are seldom active on plants growing during high summer temperatures prevalent in July, August, and September. A 3-yr. test at Davis showed that the average amount of virus infection developed in a single season in plants from healthy tubers set among diseased plants totaled 91.5 percent for the early planting, 54.3 percent for the medium planting, and 5.9 percent for the late planting. Much higher yields were obtained from the progeny of the late-planted lots than from those planted earlier.

Some reduction in spread of virus diseases was found in small test areas at Davis dusted weekly with a nicotine insecticide as compared with similar checks, but the reduction was too small to be considered in any way adequate.

The Katahdin variety bred by the U. S. Department of Agriculture and resistant to mild mosaic was found in 3-yr. tests to produce approximately the same yields as healthy White Rose at Davis. Chippewa also proved high yielding in 1 year's tests.

The importance of seed-plat isolation was demonstrated in several different regions of the State. It was proved that potentially high-yielding seed potatoes can be grown in interior California from previously tested (indexed) virus-free stocks, either by isolating the seed plat well from all sources of virus infection, if planting is done in the spring, or by delaying the planting until June 15 or later, to prevent rapid spread of the viruses. Instructions are given on the methods of tuber indexing and seed-plat management.

Effects of modifications of the potato-spray program, E. O. MADER and F. M. BLODGETT (*[New York] Cornell Sta. Bul. 621 (1935), pp. 34, fig. 1*).—The results are presented of a series of field experiments conducted over a 5-yr. period on potato spraying in western New York. The varieties Rural Russet and Smooth Rural were used, and planting was done rather late in the season. The soils were relatively alkaline (pH 7.5 or above).

Bordeaux mixture and copper-lime dusts gave increased yields over the checks to an amount considerably in excess of that attributable to any disease or insect control. Yield increases occurred as the amount of copper sulfate applied was increased up to about 75 lb. per acre for the season. At this rate the sprayed plats averaged 118.1 bu. per acre over the unsprayed controls in 24 comparisons. More than 75 lb. gave lower yields.

Maximum yields were obtained when at least 116 gal. of bordeaux mixture per acre per application were applied at 400 lb. pressure. The increase over

that obtained when the spray was applied at 200 lb. pressure is held due, in part, to the increased amount of material applied. The difference in favor of the higher pressure averaged 38 bu. per acre in 27 comparisons. The use of a pressure of 600 lb. resulted in lower yields.

As the amount of copper applied in the form of bordeaux mixture was increased, the foliage development was increased. Heavy applications early in the season apparently favored tuber formation, but heavy applications late in the season stimulated growth of foliage at the expense of tuber formation. Applying heavier dosages of copper early in the season consistently resulted in higher yields than applying the copper evenly throughout the season (average difference 22.9 bu. per acre) or applying heavier dosages late in the season (average difference 31.1 bu. per acre). Plants receiving the heavy applications early in the season reached their maximum foliage development relatively early (about the first of September) and matured a little earlier than plants receiving heavy applications late in the season.

Comparison of bordeaux mixtures made with different kinds of lime showed relatively slight differences. There was no significant difference in adhesiveness or growth of plants but a slight difference in the average yields in favor of high-magnesium lime (finishing lime). Bordeaux mixtures with smaller excesses of lime tended to give higher yields, which is attributed to the greater solubility of copper in these mixtures. It is considered unsafe, however, to recommend a mixture with less lime than the 5–2.5–50 formula.

As satisfactory results were obtained by dusting as by spraying when the dust was applied at suitable times. The indications were that more copper should be applied in the form of copper-lime dust than was used in the bordeaux spray to obtain maximum yields. With dusting as with spraying, additional gains were obtained by applying a large part of the copper early in the season and by reducing the amount of lime in the mixtures either directly or by using a high-magnesium lime, which contains more inert material.

The authors state that there are indications that the results obtained in these experiments may not apply to other varieties of potatoes under other conditions. They have not as yet made tests with the same varieties planted early in the season.

Three years' results using bordeaux mixture with reduced amounts of lime as a potato spray, F. M. Blodgett, E. O. Mader, O. D. Burke, and R. B. McCormack (*Amer. Potato Jour., 12 (1935), No. 7, pp. 171–177*).—The results of 3-yr. tests conducted by the [New York] Cornell Experiment Station both in western New York with Rural potatoes and on Long Island with Green Mountains, using bordeaux mixtures containing various proportions of lime and copper sulfate, showed consistently better yields as the proportion of lime was decreased, at least down to the 5–2.5–50 formula.

One experiment in western New York indicated that with a 5–1.25–50 mixture not so much copper per acre is necessary to give maximum yields as with mixtures containing larger proportions of lime. In view of these results it appears to the authors safe and desirable to reduce the lime in the mixture to at least half the amount of copper sulfate.

Economic importance of red rot and comparative susceptibility of some sugarcane varieties in the southern United States, E. V. Abbott (*U. S. Dept. Agr. Circ. 350 (1935), pp. 27, figs. 4*).—The results are reported of investigations on red rot of sugarcane caused by *Colletotrichum falcatum*, conducted in Louisiana over a period of several years. The disease is reported to have become a serious problem in that State in recent years due to the stand failures resulting in the variety P. O. J. 213, which had previously been considered resistant.

"Based on laboratory inoculations, the commercial varieties of sugarcane and certain promising seedlings have been classified as follows with respect to their susceptibility to red rot: Very susceptible, Purple, Ribbon, D-74, C. P. 807, and P. O. J. 213; susceptible, Co. 290, P. O. J. 36-M, C. P. 29/320, and Cayana; moderately susceptible (or moderately resistant), P. O. J. 36, P. O. J. 234, and C. P. 28/19; resistant, Co. 281, C. P. 28/11, and C. P. 29/291.

"Under field conditions C. P. 807 and Co. 290 have shown greater resistance than is indicated by the laboratory tests, which it is believed is due at least in part to their rapid germination and vigorous root development, thus preventing nodal infection by red rot. Resistance to or escape from infection through the root rings under usual field conditions in Louisiana may, therefore, permit commercial utilization of valuable varieties like these, especially Co. 290, that are inherently susceptible to the disease. It is suggested that these varieties may be also more resistant when actively growing than in the dormant state.

"In field inoculation experiments where a culture of the fungus was inserted into holes punched into alternate internodes of the stalk, P. O. J. 213, P. O. J. 36-M, and C. P. 807 showed, in general, the greatest reductions in germination and in yields of cane and sugar per acre. Smaller reductions found for P. O. J. 234, Co. 281, and Co. 290 were not significant. Higher temperatures for germination and possibly greater resistance of actively functioning tissues may account for the slight damage to Co. 290, which was susceptible in the laboratory experiments."

In a single test at Cairo, Ga., Cayana was the only one of four varieties showing a significant reduction in yield due to inoculation. The strain of the red rot fungus used had been isolated from severely rotted Cayana banked cane.

Reduction of stands due to red rot caused reduction in sucrose content and purity of the cane juice from the affected planting. This is explained by the more abundant tillering induced by the gappy stands, resulting in later maturity of the cane.

"The rind disease fungus (*Melanconium sacchari*) caused significant reductions in germination of C. P. 807, P. O. J. 213, P. O. J. 36-M, and P. O. J. 234, with corresponding losses in yields of cane and sugar per acre of all these varieties except P. O. J. 234. No significant reductions were obtained for Co. 281 or Co. 290. *Melanconium* is considered of secondary importance in seed rotting.

"The presence of two species of *Fusarium* and one of *Basisporium* in rotting seed cane were noted, but none of these organisms is believed to be of much importance."

The initiation of downy mildew of tobacco in North Carolina in 1934, L. F. Dixon, R. A. McLean, and F. A. Wolf (*Phytopathology, 25 (1935), No. 6, pp. 628-639, figs. 3*).—A study was made, using epiphytological methods, of the sources of inoculum for the primary infections of downy mildew or blue mold [*Peronospora hyoscyami*] of tobacco in North Carolina. The pathogen overwinters in this State, presumably in the oospore stage. There is no evidence that it survives on plants that may have escaped being killed by cold or that it is seed borne.

Infections developed earlier in seedbeds located on the sites occupied by seedbeds the previous year than in those on new sites. These infections occurred prior to the time that sporangia could be entrapped from the air in the same locality. The northward march of the disease is attributed to seasonal influences that modify the time of occurrence of primary infections in various

localities. Primary infections were found in 35 percent of the seedbeds on the sites of old beds. The fungus was sporulating in beds on old sites from 7 to 10 days prior to the development of the disease in any nearby seedbeds located on new sites.

It is concluded that seedbeds on the sites of old beds constitute primary centers of infection. Air-borne sporangia or sporangia carried by the grower account for secondary infections. None of the practices employed in North Carolina with seedbeds located on old sites can be depended upon to destroy all inocula in the soil. The avoidance of utilizing the same site for seedbeds in succeeding years is, therefore, of major importance in the prevention of downy mildew in the State.—(*Courtesy Biol. Abs.*)

Chemical studies on the virus of tobacco mosaic.—III, Rates of inactivation at different hydrogen-ion concentrations, W. M. Stanley (*Phytopathology, 25 (1935), No. 5, pp. 475–492*).—Continuing earlier studies (E. S. R., 72, p. 799), it was found that the rate of inactivation of tobacco-mosaic virus in diluted untreated infectious juice of *Nicotiana tabacum* (Turkish) held at 20° C. or −14° is so slow as to be negligible between pH 3 and pH 8, fairly rapid between pH 1.5 and pH 2.5 and between pH 9 and pH 10, and very rapid between pH 0.5 and pH 1.5 and between pH 11 and pH 12. The rate of inactivation of virus in purified virus preparations was similar except that the rate was somewhat less between pH 9 and pH 11. Reactivation of virus completely inactivated at pH 1, pH 2, pH 11, or pH 12 was not observed. The susceptibility of plants of *N. glutinosa* to tobacco-mosaic virus inoculated at reactions from pH 2 to pH 10.5 did not change greatly. Plants of *Phaseolus vulgaris* (Early Golden Cluster) were much more susceptible to virus inoculated at reactions from pH 9 to pH 10.5 than to virus inoculated at pH 0.5 to pH 3. Tobacco ring-spot and cucumber-mosaic viruses were much less stable than tobacco-mosaic virus, inactivation increasing as the H-ion concentration was increased or decreased from about pH 6.—(*Courtesy Biol. Abs.*)

Quantitative studies on the filtration of tobacco-mosaic virus, H. H. Thornberry (*Phytopathology, 25 (1935), No. 6, pp. 601–617*).—Reaction of suspension was found to determine the filtrability of tobacco-mosaic virus. Filtrates from Berkefeld "W" candles at pH 1.5 were noninfectious, while those at pH 8.5 were about 60 percent more infectious than unfiltered virus. At intermediate reactions the virus was partially filtrable. Virus adsorbed to the candles was readily eluted with solutions of phosphate buffers at pH 8.5. Clean filters were less permeable to virus than candles coated with materials in the virus suspensions at pH 5.6. Filtrability of the virus is explained on the basis of electrical charge on the infectious particles and on the filter surface. The particles were estimated by ultrafiltration methods to have diameters of from 18 to 38 mμ.—(*Courtesy Biol. Abs.*)

Influence of phosphorus and potassium supply on host susceptibility to yellow tobacco mosaic infection, E. L. Spencer (*Phytopathology, 25 (1935), No. 5, pp. 493–502, figs. 5*).—The influence of P and K supply on growth and susceptibility of *Nicotiana tabacum* (Turkish) to infection with yellow tobacco mosaic virus (Johnson tobacco virus 6) was studied. Plants were grown in a soil of low fertility and fed twice each week with their respective nutrient solutions. The pin-puncture method of inoculation was used. Growth was measured by green weight determinations at the time of inoculation, and susceptibility by the number of primary lesions per 100 pin punctures. In the P study, susceptibility was correlated directly with growth, since susceptibility increased when growth increased and decreased when growth fell off due to excess P. In the K study, host susceptibility was influenced more by K supply than by

growth. Susceptibility was greatest in plants receiving small amounts of K, but decreased sharply with the addition of larger amounts. Growth did not fall off appreciably until very large quantities of K were added.—(*Courtesy Biol. Abs.*)

Effect of phosphate buffers on infectivity of tobacco-mosaic virus, H. H. Thornberry (*Phytopathology, 25 (1935), No. 6, pp. 618–627, fig. 1*).—Valency of the anion or cation of the salts tested had no measurable effect on infectivity of tobacco-mosaic virus, but dibasic phosphate salts at certain concentrations increased its infectivity. Enhancement of infectivity resulted from an interaction of salt concentration and H-ion concentration. Highest infectivity was obtained with 0.1 M solutions of salts and alkaline reactions up to pH 8.5. Acidity reduced infectivity in proportion to the concentration of H ions when virus activity was measured at the given reaction. Samples exposed to reactions between pH 1.5 and 10.0 for 1 hr. and then adjusted to pH 8.5 possessed approximately the original activity. Virus exposed to 0.5 M HCl for 1 hr. and to reactions of pH 10.6 for 4 hr., pH 10.8 for 1 hr., and pH 11.2 for 5 min. was completely inactivated.—(*Courtesy Biol. Abs.*)

An example of spread of veinbanding from potatoes to tobacco, E. M. Johnson (*Phytopathology, 25 (1935), No. 6, pp. 650–652, fig. 1*).—In 1934, at the Kentucky Experiment Station, five plats of White Burley tobacco were planted at varying distances from two plats of Irish Cobbler potatoes. Records made of viruses in tobacco showed that the percentages of vein banding were much greater when it was grown near potatoes. Observations in tobacco made prior to handling operations suggested that the vein-banding virus was carried from potatoes to tobacco by insects.—(*Courtesy Biol. Abs.*)

A probable case of sulphur starvation in tobacco, W. D. Valleau (*Phytopathology, 25 (1935), No. 4, pp. 430–432, fig. 1*).—From the Kentucky Experiment Station, it is reported that a chlorosis of the tips of upper leaves of topped White Burley tobacco was observed several times in 1934 which appeared identical with sulfur starvation produced experimentally. The soil was hard and cracked, and rainfall was limited to a heavy rain about 3 weeks before the observations were made. Affected areas had not been fertilized. Affected leaves curled slowly, and chlorotic areas were lighter colored when cured than green areas. Chlorotic tips contained less sulfur, nitrogen, nicotine, crude ash, phosphorus, magnesium, and potassium than green areas.—(*Courtesy Biol. Abs.*)

Pathologico-anatomical changes in the tomato incident to development of woodiness of the fruit, P. V. Michailowa (*Phytopathology, 25 (1935), No. 6, pp. 539–558, figs. 8*).—The anatomical structure of the aerial organs of the tomato and the wild morning-glory (*Convolvulus arvensis*) affected by the virus causing "woodiness of the fruit" or stowboor is compared with that of healthy plants. On the basis of certain apparent similarities, the author considers this Crimean disease the same as the "big bud" described from Australia.

In tomatoes it is characterized by the rapid growth and vigorous hypertrophy of all tissues and fibrovascular bundles, especially of the inner phloem; by the filling of sieve tubes with yellow substances; by the gorging of the vegetative parts with starch (with the exception of leaves) and the early disappearance of starch from the fruits; and by a polystelic structure of peduncles and pedicels near the calyx and in the sprout axis of the flower near the crown. In the cortical parenchyma, leaf traces from sepals and petals are inlaid; the fibrovascular system of the fruits becomes vigorously woody, the spiral vessels being replaced by porous vessels; libriform tissues develop in great quantities, and, owing to this, the fruits are unsuitable for use; the leaves,

sepals, petals, peduncles, and stalks lose their intercellular spaces, and the anthers become deformed and the pollen shriveled and sterile.—(*Courtesy Biol. Abs.*)

The cotton root rot fungus, Phymatotrichum omnivorum, parasitic on the watermelon, Citrullus vulgaris, K. D. BUTLER (*Phytopathology, 25 (1935), No. 6, pp. 559–577, pls. 3, fig. 1*).—The four varieties of watermelon (*C. vulgaris*), Black-Seeded Klondike, Iowa King, Iowa Belle, and Pride of Muscatine, were shown by field and laboratory tests at the University of Arizona to be susceptible to Texas (cotton) root rot (*P. omnivorum*). A brief review of literature dealing with the resistance of certain plants to *P. omnivorum* is given.

Detailed cytological studies on the penetration of the fungus were made with inoculations on seedlings grown on sterile sand and soil, sterile filter paper, and agar media. Three modes of fungal invasion were noted: (1) Direct penetration into a cell, (2) growing between two epidermal cells and finally into a cell, and (3) wedging of several or many hyphae to cause a lesion. Both wedging action and softening of host cell occurred in the initial penetration by the parasite. Within host tissues the fungus hyphae advanced intracellularly as well as intercellularly. Hyphae and haustoriumlike bodies grew in direct association with host-cell cytoplasm and nuclei. Also, nuclei of uninvaded cells were less than half the size of nuclei of invaded cells. Inhibitory effects of certain fungi and bacteria on *P. omnivorum* are discussed as possible means of control. Pure-culture studies showed that it is inhibited or killed by the presence of *Trichoderma lignorum*.—(*Courtesy Biol. Abs.*)

Compilation of reports on the relative susceptibility of orchard varieties of apples to the cedar-apple rust disease, I. H. CROWELL (*Amer. Soc. Hort. Sci. Proc., 31 (1934), pp. 261–272*).—Based on published information and on letters from authorities in 36 States in which cedar rust of apples is a factor of importance, the author presents a tabulation of the relative susceptibility of a large number of apple varieties.

Soggy breakdown of Winter Banana apples, H. H. PLAGGE and T. J. MANEY (*Phytopathology, 25 (1935), No. 7, pp. 730, 731, figs. 2*).—At the Iowa Experiment Station, Winter Banana apples harvested when mature and stored immediately and at 4-day intervals after picking developed soggy break-down at 31° F. but not at 36°. The soft-scald type of the disease commonly found on Jonathan and other varieties and the typical soggy break-down of Grimes Golden and other varieties both occurred simultaneously on the same, as well as on different specimens in storage lots given the same treatment. The results give further evidence that these two types of low-temperature disease are identical.—(*Courtesy Biol. Abs.*)

Arsenical injury on the peach, R. F. POOLE (*North Carolina Sta. Tech. Bul. 49 (1935), pp. 13, pl. 1, figs. 6*).—Arsenical injury of the peach is described as affecting leaves, twigs, and fruit, causing brown spots, shot holes, defoliation, destruction of buds and twigs, cankers, and necrotic areas on the fruit and gum excretions on both twig and fruit. It is reported sometimes to cause losses in North Carolina ranging from 5 to 35 percent of the crop.

The results of studies covering several years are given. The foliage, buds, and twigs of Early Rose, Red Bird, Hiley Belle, and Georgia Belle were found injured severely by early sprays. Fruit injury was severe on Elberta, Hale, and Augbert varieties. Leaf, twig, and bud injury was found most prominent on vigorous trees, and fruit injury on weakened trees. The injury in the field was much worse under humid than under dry conditions. The temperature appeared to be of minor or no significance under North Carolina conditions.

Arsenate of lead, regardless of the source, caused severe injury when used alone or with lime.

Zinc sulfate at the rates of 3 and 4 lb. with 5 lb. of lime and 1 lb. of lead arsenate to 50 gal. of water applied in all sprays after the leaves appeared resulted in highly effective control of arsenical injury and defoliation on all varieties even under conditions highly favorable for the development of arsenical injury. Sulfur in various forms was also added to this mixture and applied successfully for disease control.

A colored plate illustrates the natural appearance of arsenical injury on the leaf, twig, and fruit.

Factors that influence the formation and development of mycorrhizal associations in citrus roots, H. S. REED and T. FRÉMONT (*Phytopathology, 25 (1935), No. 6, pp. 645–647, fig. 1*).—In studies at the California Citrus Experiment Station, the endophytic fungus produced ramifications resembling "arbuscules" in the cells of roots growing in soil fertilized with cover crops and stable manure but lived as a true parasite in the cells of roots in unfertilized soil. Typical "mycorrhiza cells" were not produced in roots grown in soils fertilized solely with sodium nitrate. Infection of roots by the endophytic fungus occurred principally in the spring when the tree was growing actively. After growth ceased, the mycorrhiza cells gradually disappeared.—(*Courtesy Biol. Abs.*)

Gloeosporium leaf spot, a serious disease of orchids, C. J. ALEXOPOULOS (*Phytopathology, 25 (1935), No. 4, pp. 435–437, fig. 1*).—Leaves of *Pholidota imbricata* were found severely infected by a *Gloeosporium*. Conidial inoculations on apples induced typical bitter rot symptoms, but no perfect stage was found or induced in culture or on any of the susceptible hosts tested.—(*Courtesy Biol. Abs.*)

A root rot of Chinese elms, H. LAMB, E. WRIGHT, and R. W. DAVIDSON (*Phytopathology, 25 (1935), No. 6, pp. 652–654, fig. 1*).—A serious root rot of Chinese elms (*Ulmus pumila* and *U. parvifolia*) throughout the Great Plains region is apparently due to *Chalaropsis thielavioides*, its pathogenicity having been proved by inoculations. Infection probably takes place in the seedbed and spreads rapidly in storage or shipment. The origin of the disease in the Great Plains region is unknown.—(*Courtesy Biol. Abs.*)

Crown gall on the Sequoia, C. O. SMITH (*Phytopathology, 25 (1935), No. 4, pp. 439, 440, fig. 1*).—At the California Citrus Experiment Station 15 twig inoculations in the spring with *Pseudomonas* [*Bacterium*] *tumefaciens* from peach on *S. gigantea* resulted after 4 mo. in one typical ¾-in. gall and a ⅛-in. gall. On *S. sempervirens* a similar number of inoculations produced only two small, doubtfully significant, knotlike outgrowths.

***Trichosporium symbioticum* n. sp., a wood-staining fungus associated with *Scolytus ventralis*,** E. WRIGHT (*Jour. Agr. Res. [U. S.], 50 (1935), No. 6, pp. 525–538, figs. 7*).—A fungus isolated from brown-stained areas associated with engraver beetle galleries in white fir (*Abies concolor*) in California is considered to be a hitherto undescribed species. It is named *T. symbioticum*, and a technical description with Latin diagnosis is given. The subglobose, hyaline conidia range from 1.8μ to 2.4μ in diameter and are borne in clusters at the tips of colorless, branched conidiophores. The fungus was found to reduce the moisture of the wood adjacent to the beetle galleries and aid in girdling the infested trees. The author believes that the fungus association may be beneficial to the successful development of the beetle broods. It is shown that the adult beetles carry the staining fungus mostly epizoically from tree to tree. Since the fungus has been found only in association with the beetle mines, it appears to depend

upon the beetles for dissemination. Artificial culture inoculations into holes made with a drill or cork borer resulted in subsequent development of stain and death of cambium. The fungus was successfully reisolated.

The root-knot nematode in Tennessee: Its prevalence and suggestions for control, W. O. Whittle and B. D. Drain (*Tennessee Sta. Circ. 54 (1935), pp. [8], figs. 3*).—This circular popularly describes and illustrates the disease produced by the root knot nematode, *Heterodera radicicola* [*H. marioni*], recorded as serious on tobacco and other plants in certain parts of Tennessee, and discusses present methods of control applicable to various crops and conditions. A table classifies different field crops, garden and truck crops, ornamental plants, and fruit and nut crops into three groups in each case, viz, badly infested, slightly infested, and seldom infested or highly resistant. Thirteen common weeds are also listed as rather highly susceptible.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Report of work with economic insects, insecticides, and red squill rat baits by the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 27, 31, 32, 38–52, 60*).—The work of the year referred to (E. S. R., 71, p. 505) relates to a systematic study of oil sprays, by E. B. Holland and A. I. Bourne; injurious and beneficial insects affecting the cranberry, including the cranberry root grub *Amphicoma vulpina*, the use of dust insecticides against the blunt-nosed leaf hopper and the black-headed fireworm, the grape anomala *Anomala errans* Fab., the chain-spotted geometer, and *Datana drexelii* Hy. Edw., all by H. J. Franklin; investigations of materials which promise value in insect control, including oil sprays for scale and the red mite in orchards, tar distillate washes for overwintering eggs of plant lice in orchards, rotenone and pyrethrum sprays for the gladiolus thrips, rotenone sprays and dusts for the Mexican bean beetle, wettable sulfurs as substitutes for lime-sulfur in post-blossom orchard sprays, control of the striped cucumber beetle with derris and pyrethrum dusts, control of the white apple leaf hopper with pyrethrum and derris dust, control of the squash vine borer with oils, soap, and nicotine, and control of the cabbage maggot with calomel dust, all by Bourne and W. D. Whitcomb; control of the onion thrips, the spray residue problem with apples, apple maggot control, introduction of parasites (*Macrocentrus*) of the oriental fruit moth, potato spraying experiments, and the value of electric light traps against orchard insect pests, all by Bourne; the apple leaf curling midge *Dasyneura mali* Kieff., the plum curculio, adaptability of *Cryptolaemus* to the control of mealybugs in the greenhouse, naphthalene as a fumigant for the control of greenhouse insect pests, the biology and control of the carrot rust fly, and the influence of temperature on the development and control of the red spider, all by Whitcomb; and work with red squill for rat baits, by R. E. Buck and E. M. Mills.

[Work with insects and rodents by the Nebraska Station] (*Nebraska Sta. Rpt. [1934], pp. 14, 17, 18*).—Brief reference is made to the work of the year on the distribution, life history, and means of control of the common Nebraska cutworms; spraying for control of codling moth and a brood study of the moth in southeastern Nebraska; and the increased destructiveness of the Kangaroo rat in cornfields in the sand hills region.

Transactions of the Twenty-first American Game Conference (*Amer. Game Conf. Trans., 21 (1935), pp. VI+484, pls. 2, figs. 37*).—Part 1 of this report of the transactions of the annual conference of the American Game Association (E. S. R., 73, p. 202), held in New York City in January 1935, relates to the general program and game management (pp. 1–201), part 2 to game breeding (pp. 203–262), and part 3 to scientific research (pp. 263–424).

The contributions on scientific research include the following: The Waterfowl Flyways of North America, by F. C. Lincoln (pp. 264–276) (E. S. R., 73, p. 68); A Comparison of Two Iowa Duck Nesting Seasons, by L. J. Bennett (pp. 277–282), contributed from the Iowa Experiment Station; The Mackenzie Delta as a Breeding Ground for Waterfowl, by A. E. Porsild (pp. 283–290); Mosquito Control and Its Effects on Aquatic Wildlife, by F. M. Uhler and C. E. Cottam pp. 291–294); The Eelgrass Situation in 1934, by C. Cottam (pp. 295–301); Sanctuary Values, by M. D. Pirnie (pp. 302–304); Waterfowl Shooting Losses Indicated by Banding Returns, by J. Moffitt (pp. 305–308); The Correlation of Game and Forest Management in New England, by J. P. Miller (pp. 309–312); The Effect of Reforestation on Game, by F. C. Edminster (pp. 313–318); The Soil Erosion Service and Wildlife, by E. G. Holt (pp. 319–325); Wild Turkey Management, by H. L. Stoddard (pp. 326–333); Evaluating the Pheasant Range, by H. M. Wight (pp. 334–341); Michigan's Studies of Sharp-Tailed Grouse, by G. B. Saunders (pp. 342–344); Wildlife Cycles in Relation to the Sun, by L. W. Wing (pp. 345–363); Ruffed Grouse in New York State during the Period of Maximum Abundance, by G. Bump (pp. 364–369); What Counts in Northern Bobwhite Management, by P. L. Errington (pp. 370–376), contributed from the Iowa Experiment Station; The Survival of Liberated Bobwhite Quail, by C. O. Handley (pp. 377–380); A Brief Study of the Willow Ptarmigan and Its Relation to Predators and Leucocytozoon Disease, by A. A. Allen and P. P. Levine (pp. 381–386); Dropping Analyses as an Indication of Pheasant Food Habits, by P. D. Dalke (pp. 387–391); A Study of the Food Preferences and Requirements of the White-Tailed Deer in New York State, by R. Darrow (pp. 392–396); Progress Report of Wildlife Disease Studies for 1934, by R. G. Green and J. E. Shillinger (pp. 397–401); The Dying-off of Ruffed Grouse, by C. H. D. Clarke (pp. 402–405); Researches on Liver Fluke in Deer, by W. E. Swales (pp. 406–411); Animal Parasites and Wildlife, by T. W. M. Cameron (pp. 412–417); and Diagnosing Disease in Game, by J. E. Shillinger (pp. 418–424).

Regulations relating to game, land fur animals, and birds in Alaska, 1935–36 (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 12 (1935), pp. 32, fig. 1*).—This circular presents (1) a summary of Alaska game law and regulations, (2) the text of the regulations respecting game animals, land fur-bearing animals, game birds, nongame birds, and nests and eggs of birds in Alaska, and (3) the regulations of the Alaska Game Commission relating to guides, poisons, and resident trapping licenses. An account of bird and wildlife refuges in Alaska and extracts from acts passed by the Alaska Territorial Legislature relating to fur and game follow.

A graphical study of the blood of normal foxes, A. H. Kennedy (*Canad. Jour. Res., 12 (1935), No. 6, pp. 796–802, figs. 9*).—The results of a study of the "fluctuations and trends of various cellular elements of normal fox blood are presented in graphical form. The graphs have been prepared from data obtained from a number of foxes of various ages, and show the minimum, maximum, and mean numbers of blood elements occurring in both males and females in each age group.

"The red blood cells, hemoglobin, and to a lesser extent the neutrophiles, on the one hand, have trends of a similar nature and appear to be related. On the other hand, the total white blood cells, lymphocytes, monocytes, and basophiles also appear to be closely related. A comprehensive picture of the field tends to divide the numbers of blood elements composing the blood of foxes into these two divisions. The trends and fluctuations, for the same age groups, of the total white blood cells and lymphocytes are almost identical. The mono-

cytes and basophiles also show close similarity. A close similarity in general trend, with less marked fluctuations, exists in the four groups, total white blood cells, lymphocytes, monocytes, and basophiles."

The life cycle of the ground squirrel (Citellus pygmaeus Pall.) and the laws of development of the plague epizootic, II, III [trans. title] (*Vest. Mikrobiol., Épidemiol. i Parazitol.* (*Rev. Microbiol., Épidémiol. et Parasitol.*), *13* (*1934*), *No. 4, pp. 291–303; Eng. abs., pp. 297, 303*).—In these contributions (E. S. R., 72, p. 691) the changes in the leucocyte picture of the ground squirrels' blood in the course of their life cycle are reported upon by G. P. Rudnev (Rudneff) (pp. 291–297), and changes in the susceptibility of ground squirrels (*C. pygmaeus*) to the plague in connection with sex and age differences, by I. S. (J.) Tinker and N. I. Kalabukhov (Kalabuchov) (pp. 299–303).

The present status of the hamster problem in Germany [trans. title], E. WERTH (*Arb. Biol. Reichsanst. Land u. Forstw., 21* (*1934*), *No. 2, pp. 201–253, pl. 1, figs. 11*).—An account of the rodent pest (*Cricetus vulgaris, C. frumentarius*, or *C. cricetus*) in Germany, presented with a list of 89 references to the literature.

Erythrocytes and hemoglobin in the blood of some American birds, L. B. and M. M. NICE and R. M. KRAFT (*Wilson Bul., 47* (*1935*), *No. 2, pp. 120–124*).—Following a brief reference to the literature, the authors present a summary of their findings on 86 birds of 16 species examined from October to May, the details being given in two tables. "The number of erythrocytes per cubic millimeter of blood was determined in 15 species of passerine and 1 species of gallinaceous birds. The lowest number found for a passerine bird was 3,930,000 in a tufted titmouse and the highest 7,645,000 in a junco. The median of the 83 counts was 5,230,000. The 1 gallinaceous bird (the bobwhite) averaged 3,532,000. The hemoglobin in 7 species of passerine birds varied between 13.3 and 17.9 g per 100 cc of blood for a titmouse and cardinal, respectively."

The crested myna, or Chinese starling, in the Pacific Northwest, T. H. SCHEFFER and C. COTTAM (*U. S. Dept. Agr., Tech. Bul. 467* (*1935*), *pp. 27, pls. 3, figs. 2*).—"Three species of starlings are now established in the United States or its Territories, as follows: The European starling (*Sturnus vulgaris*), over much of the middle-eastern and northeastern sections of continental United States and southern Canada since its successful introduction about 1890 and later, as reported by Kalmbach and Gabrielson [E. S. R., 44, p. 547]; the Indian, or house, myna (*Acridotheres tristis*), in Hawaii; and the crested myna (*Aethiopsar cristatellus*), in the Philippines."

The crested myna, or Chinese starling, was introduced into British Columbia about 1897 by persons unknown and has become thoroughly established in North America, with the city of Vancouver, B. C., as its main stronghold and central point of dispersal. A description and an account of its habits are given, followed by a discussion of its food habits in British Columbia. A comparison is then made of the food of Chinese and European starlings.

"In the laboratory study of the food habits of the crested myna, which was undertaken after the field studies of 1931–32, 117 adult and 20 juvenile stomachs were examined. These were collected over the 8-mo. period from May to December. Stomach analyses and field observations show that the bird is decidedly omnivorous, with a partiality for fruits and for foods from such unsavory sources as garbage dumps and manure piles. Availability seems to be the chief factor in its choice of food. The average monthly diet of adults was 38.89 percent animal and 61.11 percent vegetable matter, with

fruits of various species aggregating 22.49 percent, insects 22.44 percent, garbage 14.6 percent, and leafy vegetable material 8.57 percent. The nestlings are predominantly insectivorous. During the latter part of summer self-feeding juveniles and adults are highly frugivorous.

"The potentiality for harm of such a gregarious and omnivorous feeder is high. Should the species become unduly abundant in the Pacific Coast States, agricultural interests there might be seriously affected. Consequently, every precaution should be taken to check the spread of this species and to prevent its establishment in the United States."

A list is given of 35 references to the literature.

Food habits of burrowing owls in northwestern Iowa, P. L. Errington and L. J. Bennett (*Wilson Bul., 47 (1935), No. 2, pp. 125–128*).—Analyses of the pellets gathered from the local burrowing owl (*Speotyto cunicularia hypogaea* Bonaparte) colonies during the course of 1933 summer studies at Ruthven by the Iowa Experiment Station are reported upon.

Quail-food plants of the Southeastern States, A. C. Martin (*U. S. Dept. Agr. Circ. 348 (1935), pp. 16, figs. 7*).—This contribution was prepared for the purpose of facilitating recognition of the more important quail-food plants of the Southeastern States, the heart of the range of the eastern bobwhite quail (*Colinus virginianus virginianus*), and thus aid in fostering their production either in the wild or the cultivated state. The three main features of the publication are (1) a list of the chief quail-food plants arranged in order of their use, (2) brief descriptive treatments of the various species, and (3) illustrations of 28 important plants and their seeds.

The food of Rana catesbiana Shaw, S. W. Frost (*Copeia, No. 1 (1935), pp. 15–18*).—Personal observations and a reference to the literature, a list of which is included, have shown that as a rule small frogs such as *Hyla crucifer* eat small insects while the full-grown bullfrog (*R. catesbiana*) can scarcely be tempted by insects as small as a fly or a honeybee. Large moths, grasshoppers, and cicadas are accepted but they prefer crawfish, frogs, mice, or birds. A list is given of the food eaten by a 200-g bullfrog which took more than its own weight of food in less than 5 mo. Spring-tails, flies, ants, leaf hoppers, and similar insects are the favorite food of the smaller species, such as *H. crucifer*, or the smaller specimens of other frogs.

Prophylactical problems in trout and salmon culture, H. P. Kjerschow Agersborg (*Ann. Sci. Nat., Zool., 10. ser., 18 (1935), pp. 119–134*).—The first part of this contribution dealing with trout and salmon reports upon (1) white-spot disease, (2) the new disease "intestinal fungisitosis", and (3) "pot-bellied" (pp. 119–129). This is followed by a discussion of a new and better trout food (pp. 130, 131).

A manual of the common invertebrate animals (exclusive of insects), H. S. Pratt (*Philadelphia: P. Blakiston's Son & Co., 1935, rev. ed., pp. XVIII+854, figs. 974*).—A revised edition of a manual written to supply the need for a book containing descriptions of the common invertebrate animals. Bibliographies appear throughout the work. A list of authors (pp. 759–780), a glossary (pp. 781–792), and an index are included.

Longevity and fertility in the pond snail Lymnaea columella, C. P. and A. A. Winsor (*Jour. Wash. Acad. Sci., 25 (1935), No. 7, pp. 302–307, fig. 1*).—The data here presented deal with the duration of life and fertility in the pulmonate gastropod *L. columella*. The wild parents of the snails were collected in two ponds. Data on egg production show differences in fertility between strains, and show marked reduction in fertility with increasing density of

population. No significant differences exist in the date of first oviposition as between isolated and paired animals.

Earthworm control without the aid of water, R. B. Dawson and R. B. Ferro (*Jour. Bd. Greenkeeping Res.* [*England*], *4* (*1935*), *No. 12*, *pp. 56–72*).—A preliminary report of experiments and practical trials with lead arsenate in England is presented. "Tests show that applied at 1.5 to 2 oz. per square yard, or 4 to 5.25 cwt. per acre, lead arsenate is very effective for worm control. It acts under favorable conditions in a short period, but full results as regards worm control and improvement in quality of turf are not apparent until after a growing season. Experiments indicate that the lead arsenate is effective on medium soils for at least 4 yr. and possibly longer. Only limited experience is available as to its effectiveness and duration on light or peaty soils. It has no detrimental action on the grass even at such heavy rates as 16 cwt. on the surface and 32 cwt. per acre under the turf. On courses where no water is available, the use of lead arsenate (at present with certain qualifications) solves the problem of worm control, and even in the case of those with a water supply the method has considerable advantages."

A list is given of 20 references to the literature.

Applied entomology: An introductory text-book of insects in their relations to man, H. T. Fernald (*New York and London: McGraw-Hill Book Co.*, *1935*, *3. ed.*, [*rev.*], *pp. X+405*, *figs. 384*).—A revised edition of this work (E. S. R., 54, p. 752).

Insect physiology, V. B. Wigglesworth (*London: Methuen & Co.*, *1934*, *pp. X+134*, *figs. 13*).—Following an introduction, the chapters of this small handbook deal, respectively, with the integument (pp. 1–15); respiration (pp. 16–31); the circulatory system and the blood (pp. 32–41); digestion (pp. 42–55); excretion (pp. 56–69); nutrition and metabolism (pp. 70–85); reproduction and growth (pp. 86–99); and the nervous system, sense organs, and behavior (pp. 100–115). A list of 229 references to the literature and an index are included.

The history of an insect's stomach, R. E. Snodgrass (*Smithsn. Inst. Ann. Rpt.*, *1933*, *pp. 363–387*, *figs. 15*).—A popular account.

Viviparity in insects, H. R. Hagan (*Jour. N. Y. Ent. Soc.*, *43* (*1935*), *No. 2*, *p. 251*).—A brief description is given of the four types of bigametic viviparous reproduction recognized, namely, ovoviviparity, adenotrophic viviparity, exgenital viviparity, and pseudoplacental viviparity.

Connecticut State entomologist, thirty-fourth report, 1934, W. E. Britton (*Connecticut* [*New Haven*] *Sta. Bul. 368* (*1935*), *pp. 147–262+XI–XVI*, *figs. 21*).—Following a discussion of the entomological features of 1934 (pp. 151–154) (E. S. R., 71, p. 504) and a presentation of the insect record of the year (pp. 154–169), reference is made to the conference of Connecticut entomologists held in October (p. 170). Details are presented of the inspection of nurseries, 1934, by Britton and M. P. Zappe (pp. 171–181), and of apiaries, by Britton (pp. 182–188); control work with the gypsy moth, by Britton and J. T. Ashworth (pp. 188–197); the European corn borer in the State, by Britton, Zappe, J. P. Johnson, and N. Turner (pp. 198–206); Japanese beetle work in the State, by Johnson (pp. 206–208); and present status of saltmarsh mosquito ditching in the State, by R. C. Botsford (pp. 208, 209). A report of tests of apple sprays, by Zappe and E. M. Stoddard (pp. 210–212) is followed by a report of an outbreak of cankerworms (pp. 213–220) and the beech scale (pp. 220–224), both by Britton, and the squash bug, by D. C. Elliott (pp. 224–231). Then follow accounts of the parasites of the oriental fruit moth, by P. Garman and J. C. Schread (pp. 231–234); lead arsenate substitutes (pp. 235, 236), further tests with zinc sulfate as a corrective for lead arsenate burn on peaches (pp.

236, 237), the toxicity of pure anabasine and pure nicotine for the bean aphid (pp. 238, 239), and control experiments against the white apple leaf hopper (pp. 239, 240), all by Garman; observations on termite damage in the State, by Turner, J. F. Townsend, and Zappe (pp. 241–245); control of insects of ornamental plants, 1934 (p. 245), and tests on the control of certain vegetable insects (pp. 245–247), both by Turner; and the European pine shoot moth and white pine weevil control by the Civilian Conservation Corps and the Civil Works Administration, by R. B. Friend (pp. 247–249).

Miscellaneous insect notes (pp. 249–258) consider the holly leaf miner, forest tent caterpillar, pickle worm, green striped maple worm, monarch butterfly, a new dermestid beetle (*Dermestes peruvianus* Cast.), webbing clothes moth, work on the identity of *Ascogaster carpocapsae* (Vier.) and *A. quadridentata* Wesm., a springtail troublesome in houses (*Sira* (*Seira*) *nigromaculata* Lubb.), sulfur dusts effective against thrips (greenhouse thrips and onion thrips) in the greenhouse, winter breeding of the apple maggot, the pear leaf midge *Dasyneura* (*Perrisia*) *pyri* Bouché, dermestids (*Dermestes nidum* Arr.) troublesome in houses, the American cockroach, another probable carrier (*Hylurgopinus rufipes* Eich.) of Dutch elm disease (*Ceratostomella* (*Graphium*) *ulmi*), and the bagworm.

Following the discovery of the occurrence of the beech scale at Hartford in September 1934, the first in Connecticut (pp. 220–224), a survey was made in that city and 23 towns and resulted in the finding of 138 infested trees in the Hartford area. A study of this pest by Ehrlich is noted on page 651.

In a comparison of anabasine and nicotine (pp. 238, 239), it was found by Garman that the former is a much (3 or 4 times) stronger killing agent than nicotine for the aphids on which it has been tested (the bean aphid), and is probably so for other species.

It appears from experiments by Garman and previous work (pp. 239, 240) that (1) nicotine sulfate affords good protection at 1–800 without soap and (2) anabasine sulfate is at least as effective for white apple leaf hoppers as nicotine sulfate and in some cases more effective. It would appear also that supposed liberation of nicotine by the soap is a disadvantage in leaf hopper control since part of the insecticidal action is residual. More inert spreaders, therefore, would probably be advantageous in control of this insect.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc., No. 31* [*1934*], *pp. 48, fig. 1*).—Contributions presented at the thirty-third annual meeting of the society, held in March 1934, include the following: A Review of Plant Quarantine Work in British Columbia, by H. F. Olds (pp. 8, 9); Notes on Ticks and Insect Parasites of Game Animals in British Columbia, by E. R. Buckell (pp. 10–16); A Preliminary Report of the Lizard-Tick Relationship on the Coast of British Columbia, by J. D. Gregson (pp. 17–21); Some Meteorological Observations in Relation to the Spruce Budworm, by W. G. Mathers (pp. 22–27); Some Food Plants of Lepidopterous Larvae—List 2, by J. R. J. Llewellyn-Jones (pp. 28–32); Observations on Nomenclature and Taxonomy of Coleoptera, by R. Hopping (pp. 33–35); The Family History of *Necrophorus conversator* Walker, by H. B. Leech (pp. 36–40); Notes on the Blister Made by *Eriophyes pyri* Nal., by A. D. Heriot (pp. 41, 42); The Bedbugs of British Columbia, by G. J. Spencer (pp. 43–45); and Additions to the List of B. C. Hemiptera, by W. Downes (pp. 46–48).

An entomological investigation in St. Vincent, J. G. Myers (*Trop. Agr.* [*Trinidad*], *12* (*1935*), *No. 6, pp. 139–144*).—It is recommended that the giant toad (*Bufo marinus*), which does not occur on the island of St. Vincent, be introduced from Trinidad.

Two sugarcane moth borers, the sugarcane borer and *Diatraea canella*, are said to infest the cane to the extent of 48 percent of the stalks and 7.8 percent of the joints. Of 7 different grass hosts found infested in St. Vincent, 4 are important as a reservoir of the borer, at the same time acting as a reservoir for borer parasites. Of the 3 parasites of *Diatraea* found in St. Vincent, none is of much practical importance. It is recommended that either of the tachinid parasites, *Lixophaga* or *Paratheresia*, be introduced to control the sugarcane borer as soon as the results of the experiments in Antigua and Barbados have been reported.

Insect enemies of arrowroot, cotton, and banana are also considered.

[Report of entomological investigations, 1932 and 1933] (*Expt. and Res. Sta., Cheshunt, Herts, Ann. Rpts., 18 (1932), pp. 49–57; 19 (1933), pp. 69–77*).—The work briefly reported for 1932 relates to Mushroom Pests (pp. 49–51), The Red Spider Mite [the Common Red Spider] (pp. 51, 52), Poison Baits for Woodlice (pp. 52, 53), Thrips as Pests of Glasshouse Plants (pp. 53, 54), and Experiments on the Control of Thrips (pp. 54, 55), all by E. R. Speyer; Red Spider Mite Control, by O. B. Orchard and W. H. Read (pp. 55, 56); and Cucumber Root Fly Larvae (*Plastosciara perniciosa* Edw. and *Psyxia scabiei* Hopk.), by O. B. Orchard (p. 57).

The work for 1933 reported relates to The Red Spider Mite [the Common Red Spider], by E. R. Speyer (pp. 69–71); Tomato-Moth Caterpillar [*Polia oleracea* L.] (pp. 71, 72); Parasites of the Tomato-Moth (pp. 72, 73); Thrips (pp. 74, 75); Millepedes (p. 75); and Investigations of the Control of Wireworms (pp. 76, 77) and A Combined Fungicide and Insecticide for Use in Controlling Tomato Leaf Mould and the Red Spider Mite [the Common Red Spider] (p. 77), both by O. B. Orchard.

[Contributions on economic insects and insecticides] (*East Malling [Kent] Res. Sta. Ann. Rpt., 22 (1934), pp. 165–216, pl. 1, figs. 5; 236–238*).—Among the contributions presented are the following: Notes on Mite and Insect Pests for the Year 1934, by A. M. Massee (pp. 165–172); Notes on the Strawberry Aphis (*Capitophorus fragariae* Theo.), by A. M. Massee (pp. 173–176), with an Appendix on the Bibliography of Papers Dealing with Aphids on Strawberries, by F. J. D. Thomas (pp. 177–179); Apple Blossom Weevil [*Anthonomus pomorum* (L.) Curt.] Experiments in 1934—Impregnation of Tree Banding Materials, by R. M. Greenslade, A. M. Massee, and F. J. D. Thomas (pp. 180–184); Laboratory Trials of Wetters against Woolly Aphis (*Eriosoma lanigerum* (Hausm.)), by R. M. Greenslade (pp. 185–190); Studies on *Byturus tomentosus* Fabr.—V, 1934 Experiments on the Control of the Raspberry and Loganberry Beetle, by W. Steer (pp. 191–193) (E. S. R., 68, p. 648); Field Spraying and Dusting Trials on the Control of Apple Blossom Weevil [*Anthonomus pomorum* L.] and of Apple Sawfly [*Hoplocampa testudinea* Klug.] in 1934, by W. Steer and F. J. D. Thomas (pp. 194–204); Preliminary Experiments on the Control of Apple Surface-Eating Tortricid Larvae [Mainly *Cacoecia podana* Scop.], by F. J. D. Thomas (pp. 205–207); A Field Spraying Trial of Combined Fungicide-Contact-Insecticide Sprays in 1934—A Progress Report, by M. H. Moore and H. B. S. Montgomery (pp. 208–216); and Observations on Woolly Aphis (*Eriosoma lanigerum* (Hausm.)) in 1934, by R. M. Greenslade (pp. 236–238).

[Agricultural pests observed in Yorkshire during 1934], W. E. Collinge (*Yorkshire Agr. Soc. Trans., 92 (1934), pp. 66–71, 72, 73*).—Notes are presented on the animal pests of farm and garden, fruit trees, and forest and ornamental trees, and on gapes in fowls.

Insect pests of 1934, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans., 5. ser., 47 (1935), pp. 94–118, figs. 15*).—In addition to the cleg (*Haematopota pluvialis*) and other horseflies, to which particular attention is given (pp. 94–110), notes are presented on the brown chafer *Serica brunnea*, the bristly rose slug *Cladius difformis*, and the turnip fly or flea beetle *Phyllotreta undulata*.

[Contributions on economic entomology] (*Ztschr. Angew. Ent., 21 (1934), Nos. 1, pp. 181, figs. 51; 2, pp. 183–328, figs. 54; 3, pp. 333–500, pl. 1, figs. 91; 21 (1935), No. 4, pp. 501–646, figs. 55*).—The contributions presented (E. S. R., 72, p. 216) are as follows:

No. 1.—The Biology and Ecology of *Parasetigena segregata* Rond. and *Sarcophaga schützei* Kram., with Observations on the Importance of the Two Species in Forests, by K. Gösswald (pp. 1–23); The Plum Borer *Euvolvulus* (*Rhynchites*) *cupreus* (L.), by O. Jancke (pp. 24–64); The Relation of the European Corn Borer to Its Host Plants, by F. Eckstein (pp. 65–88); Studies of the Entomophthoraceae, I–IV, by G. Lakon (pp. 89–95); *Agriotes lineatus* L. and *A. obscurus* L. (A Contribution to Their Morphology and Biology), by W. Subklew (pp. 96–122); and The Bark Beetles (Ipidae) and Their Natural Host Plants—A Comparative Study, I, by R. Kleine (pp. 123–181).

No. 2.—The Feeding Activity of Forest Pests as Influenced by Age, Temperature, and Humidity and Its Practical and Physiological Importance—I, Investigations of *Dendrolimus pini* L., by K. Gösswald (pp. 183–207); The Physiological Evaluation of Pyrethrum Dust, by H. Kemper (pp. 208–223); The Preferred Temperature of the Stable Fly, by O. Nieschulz (pp. 224–238); Contribution to the Morphology and Physiology of the Genital Apparatus of the Female Lepidoptera, by H. Weidner (pp. 239–290); and The Fauna of the Asparagus Field, by M. Dingler (pp. 291–328).

No. 3.—Dependence of Nun Moth (*Lymantria monacha* L.) Development on Temperature and Its Scientific Evaluation in Population Studies, by W. Zwölfer (pp. 333–384); The Effect of Wind on the Development of Lepidoptera, by O. Henze (pp. 385–405); The Struggle for Space by the Oyster-Shell Scale (*Lepidosaphes ulmi* L.), by E. Smirnov and W. Polejaeff (pp. 406–414 (E. S. R., 72, p. 812); The Two Asparagus Beetles (*Crioceris duodecimpunctata* L. and *C. asparagi* L.), by M. Dingler (pp. 415–442); *Asphondylia prunorum* Wachtl (Diptera, Cecidomyidae) and Its Galls on Plum Trees, by E. W. Puzanowa (pp. 443–462); and Observations and Experiments Made during an Outbreak of *Lophyrus sertifer* Geoffr. (*rufus* Panz.) in South Corinthia in 1931–32, by F. Schönwiese (pp. 463–500).

No. 4.—Experimental Investigations on the Influence of Temperature and Humidity on the Mortality and Development of *Malacosoma neustria* L., by M. Bekir (pp. 501–522); Experimental Investigations of the Ecology of *Aporia crataegi* L. (The Influence of Temperature and Humidity on the Length of the Life Cycle and on Mortality), by N. Statelow (pp. 523–546); The Question of Granary Weevil Control by Use of HCN Gas, by G. Peters and W. Ganter (pp. 547–559); A Contribution to the Knowledge of Lepidopterous Enemies of Siberian Conifers, by W. Ermolajew and W. Wassiljev (pp. 560–565); Descriptions of New Genera and Species of the Family Trichogrammidae (Hym., Chalcidoidea) from the Palearctic Region, with Notes, I, by S. Nowicki (pp. 566–596) (in English); and Bark Beetles (Ipidae) and Their Natural Host Plants—A Comparative Study, II, by R. Kleine (pp. 597–646) (see above).

[Contributions on economic insects and their control] (*Indian Sci. Cong. Proc. [Calcutta], 21 (1934), pp. 90–94, 263–267, 377*).—Brief abstracts of papers presented at the Twenty-First Indian Science Congress, held at Bombay in

January 1934, include the following: Insect Phototropism and Its Economic Importance in India, by T. V. Ramakrishna Ayyar and K. P. Anantanarayanan (p. 90); Moth Borers of Sugarcane in South India, by T. V. Ramakrishna Ayyar and V. Margabandhu (pp. 90, 91); *Epilachna* Beetles and Their Control, by M. A. Husain and S. A. Shah (p. 91); *Batocera rubra* Linn. (Fig Borer), by M. A. Husain and M. A. W. Khan (p. 91); Observations on the Palm Weevil *Rhynchophorus ferrugineus* Fb. as a Pest of Coconuts in Cochin, by C. S. Venketasubban (pp. 91, 92); An Unusual Infestation by Lepismidae, by M. A. Husain (p. 92); Why Do Locusts Eat Wool? by M. A. Husain and C. B. Mathur (p. 92); Colour Change at Sexual Maturity in *Schistocerca gregaria* Forsk., by M. A. Husain (p. 92); Insecticides and Their Use in India, by T. V. Ramakrishna Ayyar (pp. 92, 93); A Very Destructive Caterpillar Pest [*Corcyra cephalonica* Staint.] of Stored Products in South India, by P. N. Krishna Ayyar (p. 93); A New Pest [*Noctuella*] on *Moringa* in S. India, by C. J. George (pp. 93, 94); An Annotated List of the Ichneumon Wasps Noted from South India, by T. V. Ramakrishna Ayyar and K. Brahmachari (pp. 263, 264); On the Bionomics of a Bag-Worm on Banana (*Acanthopsyche* sp.), by K. Brahmachari (p. 264); First Record of the Chalcid Genus *Comperiella* H. from India (*C. indica* n. sp.), by T. V. Ramakrishna Ayyar (p. 264); On the Development of the Peritrophic Membrane in *Aedes* (*Stegomyia*) *albopictus* Skuse (Diptera), by P. Sen (p. 264); The Development of the Female Efferent Ducts in *Apis* and *Melipona* (p. 265) and The Metamorphosis of the Ventral Nerve Chord in *Apis* and *Melipona* (pp. 265, 266), both by C. J. George; On the Reproductive System of Bruchid Beetles, by D. D. Mukerji and M. A. Hakim Bhuya (p. 266); Preventing Damage by Termites in Buildings in India, by S. K. Ghose (p. 266); Diapause in the Mealy-Bug *Monophlebus*, by M. Singh (p. 266); Probable Functions of the Various Parts of the Nervous System of the Ak Grasshopper (*Poecilocerus pictus*), by S. Singh (pp. 266, 267); Preliminary Observations on the Ecology of the House-Fly *Musca domestica*, by Naseer-ud-Din (p. 267); Observations on Some Factors Governing the Emergence of Anopheline Mosquitoes, by P. Sen (p. 267); and Studies in Mosquitoes and Mosquito-Transmitted Diseases in Calcutta, by B. C. Basu (p. 377).

Entomological investigations, G. A. Julius et al. (*Aust. Council Sci. and Indus. Res. Ann. Rpt., 8 (1934), pp. 16–23*).—This report of the work of the year (E. S. R., 71, p. 506) with economic insects includes accounts of the entomological control of noxious weeds; parasites of the buffalo fly pest *Lyperosia exigua*; sheep blowflies, in which it was found that *Calliphora nociva* and *C. australis* were important early in the season in the southwestern parts of Australia and replaced later in the season by *Lucilia cuprina*, also the problem of susceptibility, carcass disposal, trapping, and jetting; a study of the apple blossom thrips *Thrips imaginis* Bagn.; apicultural work; field crop and pasture pests, particularly the clover springtail *Sminthurus viridis* and its attack by *Biscirus lapidarius* and the underground grass grub *Oncopera intricata* and its dipterous parasite *Hexamera* (*Protohystricia*) sp.; work with termites; natural enemies of pine *Chermes*; transmission of pathogenic hematozoa by flies; etc.

Experiments indicate that transmission of anaplasmosis by the stable fly under natural conditions is extremely unlikely. Needle inoculation experiments indicated the failure of the stable fly and of *Tabanus circumdatus* to transmit *Anaplasma marginale* to be partly due to the interval between bites, the minimum time being 9 sec., and partly to the shallow penetration of the proboscis. In experiments with *A. centrale*, which organism is similar to *A. marginale* but has little, if any, effect on the health of cattle, it was

found that (1) a decided positive cross-immunity between it and *A. marginale* develops in normal cattle, (2) the immunity (premunition) is stronger for *A. centrale* against subsequent *A. marginale* than the reverse, and (3) removal of the spleen interferes seriously with the mechanism responsible for the development of cross-immunity. Attempts to transmit *Babesia bigeminum* to an uninfected calf by bites of 53 stable flies after they had fed on an infected calf gave negative results. Blood with *Theileria mutans* gave a well-developed infection upon injection into calves; blood from 1 of these calves injected subcutaneously into 2 sheep, and 50 days later from these sheep to 2 fresh calves, produced a mild *T. mutans* infection.

Report of the entomologist, C. Smee (*Nyasaland Dept. Agr. Ann. Rpt., 1934, pp. 16–18*).—This report of the work of the year (E. S. R., 72, p. 502) relates to the development, movement, damage, and natural enemies of *Locusta migratorioides* and *Nomadacris septemfasciata*.

[Contributions on fruit insects and their control] (*N. Y. State Hort. Soc. Proc., 80 (1935), pp. 7–15, 25–33, 180–185, 250–266, pls. 2*).—Contributions presented at the annual meeting of the society held at Rochester and Kingston in January 1935 include the following: Spray Service Problems in 1934 and 1935, by C. R. Crosby (pp. 7–15); Spray Problems: In Retrospect and Prospect, by P. J. Parrott (pp. 25–33); and The Role of Arsenicals in the Hudson Valley Spray Program for Apples, by P. J. Chapman (pp. 180–185), and The Spray Residue Problem of Currants, by P. J. Chapman and G. W. Pearce (pp. 250–266), both contributed from the New York State Experiment Station.

[Pests of citrus orchards in southern Turkey], F. S. Bodenheimer (*Hadar, 8 (1935), No. 1, pp. 12–14, figs. 2*).—Observations made on pests in citrus orchards in the Adana, Mersin (Mersina), and Dörtyöl districts in southern Turkey in April 1934 are reported.

Three shade tree insects.—II, Great elm leaf-beetle, catalpa sphinx, and eastern tent caterpillar, W. J. Baerg (*Arkansas Sta. Bul. 317 (1935), pp. 28, figs. 18*).—In the study reported (E. S. R., 59, p. 252) the distribution, importance, morphology, life history, and habits of the great elm leaf beetle *Monocesta coryli* Say, the catalpa sphinx, and the eastern tent caterpillar are taken up, with recommendations for control.

The larvae of the great elm leaf beetle, which hibernate in the soil, commence pupation late in April, requiring an average of 19 days. Adults normally commence emerging late in May, and, after feeding for a week or longer, the females deposit one or two egg masses. Incubation requires an average of 16.5 days, and larvae mature on an average in 28 days. It is said that owing to unfavorable conditions, presumably climatic, this pest disappeared in 1930 and has not since been seen in the State.

In work with the catalpa sphinx, two complete generations and a partial third were reared. It is pointed out that the more favorable seasons will allow for three complete generations. An undescribed species of *Telenomus* which parasitizes the egg was found supplementing the work of the more common parasite of the larva, *Apanteles congregatus*.

The eastern tent caterpillar is common and often abundant in the State.

A list is given of 32 references to the literature.

Insect pests of elms in Connecticut, W. E. Britton and R. B. Friend (*Connecticut [New Haven] Sta. Bul. 369 (1935), pp. 263–307, figs. 39*).—The increased demand for information on the insect enemies of the elm, brought about by the appearance of the Dutch elm disease in the State, led to the preparation of this practical summary of information on these insects and means of combating them.

Insects injurious to stored grain [trans. title], L. MESNIL (*Rev. Path. Vég. et Ent. Agr.*, *21* (*1934*), *No. 2–3*, *pp. 16–29*, *pl. 1*).—A brief account of insect enemies of stored grain, of which the granary weevil, the rice weevil, *Rhizopertha dominica* F., the Angoumois grain moth, and the European grain moth are the most important.

Entoma: A directory of insect pest control, edited by C. C. HAMILTON (*Plainfield, N. J.: Boise Ptg. Co., 1935, pp.* [*2*]+*101*+[*1*]).—This directory, published by the Eastern Branch of the American Association of Economic Entomologists, lists insecticide manufacturers, insecticides, chemicals used in insecticides, insecticide machinery, entomological supplies and equipment, biological testing laboratories, consulting entomologists or chemists, insect pest control companies, etc.

[**Lists of United States patents relating to insect traps**], compiled by R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Pat. Lists, 1935, Nos. 41, pp.* [*34*]; *42, pp.* [*26*]; *43, pp.* [*23*]; *44, pp.* [*15*]; *45, pp. 12*; *46, pp.* [*22*]; *47, pp.* [*8*]).—These further lists of United States patents issued from 1917 to 1933, inclusive (E. S. R., 73, p. 207), relate, respectively, to screens for windows and doors, parts 1 and 2; rolling window screens; window screens, extensible; apparatus for destroying smut on grain; mothproof garment bags and chests and other devices for combating clothes moths; and screens for protecting man, plants, and foods from insects.

A review of non-chemical United States patents issued from 1917 to 1933, inclusive, relating to insect control, R. C. ROARK (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, pp. 4*).—This further contribution reviews the 47 patent lists covering the years 1917 to 1933, inclusive, and deals with 3,450 devices. The data summarized indicate that less than 0.5 percent of the country's inventive energy is being turned to the problem of insect control by mechanical means.

Bibliography of chloropicrin, 1932–1934, R. C. ROARK and R. L. BUSBEY (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1935, E–351, pp. 15*).—This first supplement includes papers published in 1932 that were not available at the time the earlier list (E. S. R., 71, p. 219) was being prepared. The list for 1934 covers only papers that were abstracted in leading abstract journals during 1934

Derris insecticides.—IV, Further studies on the insecticidal properties of derris root residues extracted with different solvents, P. GRANETT (*New Jersey Stas. Bul. 583* (*1935*), *pp. 12*).—Further studies of derris insecticides (E. S. R., 73, p. 344) led to the following findings:

"Ethyl alcohol was the only solvent which removed practically all the insecticidal substances from the root, leaving a residue which produced slight, if any, effect on silkworms or aphids. All the marcs tested, except that from the alcohol extraction, exerted a deterrent effect on silkworms. The percentage of total extractives obtained from derris root varies with the type of organic solvent used. Water-soluble solvents tend to extract more total solids from the root than do water-insoluble solvents. However, the removal of a large percentage of total extractives by a solvent does not always indicate more efficient insecticidal extractive properties. Tests on insects with the marcs and with certain of the extracts indicate that the water-soluble solvents also extract more of the active insecticidal ingredients. Reextraction with the same solvent after 10 hours' continuous Soxhlet extraction removes very little, if any, additional solids or insecticidal material from the root. Successive extraction with a water-soluble solvent (acetone or alcohol) of a residue

previously extracted with a water-insoluble solvent (ether or carbon tetrachloride) removes additional insecticidal constituents."

The toxic value of Derris spp., N. C. E. MILLER (*Straits Settlements and Fed. Malay States Dept. Agr., Sci. Ser. No. 16 (1935), pp. [2]+44, pls. 2*).—Descriptions are given of 347 tests made with a view to showing the relative toxicity to certain insects, fish, and one species of rat of aqueous and alcoholic solutions and dusts of *D. elliptica* (from two sources), *D. malaccensis sarawakensis*, the ether extract of *D. elliptica*, and of three constitutents of derris, viz. rotenone, deguelin, and toxicarol.

The conclusions arrived at in respect to the three kinds of derris are that as regards the insects tested, there is little difference in toxicity and the rotenone content is not necessarily a reliable index to the toxic value. "Rotenone, deguelin, and toxicarol dissolved in acetone are toxic to fish, but only moderately so to the insects used in the tests; rotenone is ineffective as a stomach poison to the cockroach *Periplaneta americana* L. and to the rat *Rattus rattus diardi* Jent. Aqueous solutions, ether extract, and dust of derris incorporated in baits for *P. americana* had a repellent action. The loss in toxicity of aqueous solutions of derris on standing is far less rapid than is generally thought to be the case.

"Although further experiments are essential before a definite statement should be made, the indications are that derris acts as a repellent to insects, the nervous system of which it also affects through the integument. That derris has been shown to be toxic to insects without actual contact indicates that it yields a volatile poisonous substance."

The early instars of the firebrat Thermobia domestica (Packard) (Thysanura), J. A. ADAMS (*Iowa Acad. Sci. Proc., 40 (1933), pp. 217–219*).—This contribution relates to one of the minor household pests of Iowa, which, under a constant temperature of 37° C. and other favorable conditions, is reared the year around.

Termites in relation to veld destruction and erosion, T. J. NAUDE (*Union So. Africa Dept. Agr. Bul. 134 (1934), pp. 20, figs. 14*).—A general discussion of the harvester (*Hodotermes* group) and mound-building (*Trinervitermes* group) termites of the Union of South Africa, and of means for their control.

The temperature and humidity relations of the cockroach Blatta orientalis.—II, Temperature preference, D. L. GUNN (*Ztschr. Vergleich. Physiol., 20 (1934), No. 5, pp. 617–625, figs. 8*).—A continuation of the studies previously noted (E. S. R., 72, p. 362).

The temperature and humidity relations of the cockroach.—III, A comparison of temperature preference and rates of desiccation and respiration of Periplaneta americana, Blatta orientalis, and Blatella germanica, D. L. GUNN (*Jour. Expt. Biol., 12 (1935), No. 2, pp. 185–190, figs. 2*).—This is the third part of the contribution above noted.

The effect of acetic acid vapor treatment on blood cell counts in the cockroach Blatta orientalis L. (Blattidae: Orthoptera), R. A. FISHER (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 146–153*).—This is a contribution from the Idaho Experiment Station, the details of which are given in tabular form.

The effect of heavy rains on the Orthoptera (grasshopper) population of the prairie, G. O. HENDRICKSON (*Iowa Acad. Sci. Proc., 40 (1933), pp. 238, 239*).—A record of the grasshopper population on a 1-acre plat of *Stipa spartea* and *Andropogon scoparius* on the prairie northwest of Ames, Iowa, in which 18 species were recorded, suggested that the heavy rainfall was the

major factor responsible for the approximately 30 percent decrease in population during the 10-day period August 8 to 19, 1932.

Preliminary notes on injurious rice grasshoppers of the genus Quilta Stål from south China and Cochin China (Orthoptera: Acrididae), E. R. TINKHAM (*Lingnan Sci. Jour., 14 (1935), No. 2, pp. 321–325*).—There is said to be little doubt that the various species of *Quilta* are rice pests, although this cannot be definitely determined until a further study has been undertaken.

Larra analis Fabricius, a parasite of the mole cricket Gryllotalpa hexadactyla Perty, C. E. SMITH (*Ent. Soc. Wash. Proc., 37 (1935), No. 4, pp. 65–82, figs. 6*).—Observations of the biology and habits of *L. analis*, conducted by the U. S. D. A. Bureau of Entomology and Plant Quarantine in cooperation with the Louisiana Experiment Station at Baton Rouge, La., from 1922 to 1926, inclusive, have shown that this digger wasp is an important aid in the control of the northern mole cricket. The wasp is said to differ from other members of the group in that the paralysis of its host lasts just long enough to permit the deposition of its egg. The mole cricket, upon recovering, reenters the soil, makes burrows, and acts in a more or less normal manner until killed by the developing larva. At Baton Rouge there are at least three generations per year, with the majority of the adults occurring in the field in June, August, and October. The wasps feed on various nectar-producing plants.

"The larva of *L. analis* has five instars. During the first four stadia the larva feeds on the body juices obtained through an aperture in the body wall. Upon the completion of feeding and just before molting, the fourth-instar larva kills the host. During the fifth and last stadium, the larva feeds on the muscular parts of the host's body. The cocoon is formed in the midst of the remains of the host, or not more than an inch or two away."

Two new species of Stephanothrips from South Carolina and key to the known species (Urothripidae: Thysanoptera), J. G. WATTS (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 126–130, figs. 3*).—Contributing from the South Carolina Experiment Station, the author presents descriptions of *S. corticinus* n. sp. from Spanish moss and *S. fusiantennatus* n. sp. from dead pine wood, both from South Carolina.

Thrips investigation.—VI, Further observations on the seasonal fluctuations in numbers of Thrips imaginis Bagnall and associated blossom thrips, J. W. EVANS (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 2, pp. 86–92, figs. 5*).—In continuation of earlier studies (E. S. R., 72, p. 811), curves showing the abundance of *T. imaginis*, *Haplothrips victoriensis*, and *Isoneurothrips australis* in roses at Adelaide for the years 1932, 1933, and 1934 are presented. The abundance of the onion thrips in the flowers of *Echium plantagineum* (Salvation Jane) during the spring months of the same years is also dealt with. While the first three indigenous species decreased in abundance during the period over which observations were made, the onion thrips, an introduced insect, increased. The factors underlying the progressive decrease in numbers of *T. imaginis* are discussed.

Oviposition studies on the chinch bug (Blissus leucopterus (Say)), M. J. JANES (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 109–120, figs. 4*).—In the course of studies at the Iowa Experiment station "34 overwintered female chinch bugs (*B. leucopterus* (Say)) laid an average of 544 eggs. One female produced 1,091 eggs. Overwintered females laid a greater number of eggs than the females of either of the two succeeding summer generations. Egg production was greater at 29.5° C. than at either 24.5° or 34.5°. Longevity of males exceeded that of females, and in some cases individuals lived for nearly 4 mo."

An undescribed rubber tingitid from Brazil (Hemiptera), C. J. Drake and M. E. Poor (*Jour. Wash. Acad. Sci., 25 (1935), No. 6, pp. 283, 284, fig. 1*).—*Leptopharsa heveae*, taken in large numbers on the leaves of the rubber tree (*Hevea brasiliensis*) in Brazil, is described as new.

A study of peach yellows and its insect vector, A. Hartzell (*Contrib. Boyce Thompson Inst., 7 (1935), No. 2, pp. 183–207, figs. 7*).—This contribution reports the results of experimental work extending over a number of years, with special reference to the relation of insects to the spread of the disease and the study of the plum and peach leaf hopper *Macropsis trimaculata* Fitch, its insect vector.

"Peach yellows was transmitted experimentally by means of both nymphs and adults of the plum and peach leaf hopper *M. trimaculata* from diseased peach trees to 14 young healthy peach seedlings. About 16 percent of the trees exposed to infected leaf hoppers took the disease. Forty-seven other species of insects and mites failed to transmit the disease. The disease was transmitted also experimentally by budding. Healthy seedlings budded with positively diseased buds showed symptoms of the disease from 1 to 2 yr. in advance of trees budded with normal-appearing buds from diseased trees. The disease was not transmitted by means of diseased pollen or by mechanical inoculation.

"The habits of the insect vector differ markedly from that of most species of leaf hoppers. This, with the paucity of its population on peach, has no doubt delayed its detection as the vector of peach yellows. A study was made of the life history, habits, and population of *M. trimaculata*. A positive correlation of the insect vector to wild plum and the incidence of the disease was noted. The removal of wild plum from the vicinity of peach orchards, combined with the usual practice of roguing diseased trees, are suggested as a possible means of control."

A list is given of 34 references to the literature cited.

Mechanical equipment for grape leafhopper control, O. C. French (*Agr. Engin., 16 (1935), No. 6, pp. 213, 214, 217, 218, figs. 4*).—A practical summary of information.

The rhododendron white fly, G. F. Wilson (*Jour. Roy. Hort. Soc., 60 (1935), No. 6, pp. 264–271, pls. 4*).—Observations of *Dialeurodes chittendeni* Laing, first noted on hardy rhododendrons at Chiddingfold in 1926 and later at Ascot in 1928, are reported upon. A formula which has given satisfactory control consists of white oil emulsion 1.75 pt., nicotine (96 percent) 0.75 fluid oz., and water 10 gal.

The symbionts of Pseudococcus brevipes (Ckl.), W. Carter (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 60–71, pls. 4*).—Contributing from the Hawaiian Pineapple Producers' Experiment Station, the author calls attention to the fact that the symbionts of the pineapple mealybug are enclosed within a mycetome, as in other species of the same genus of mealybugs. "The species is bisymbiotic. One species of symbiont is sometimes yeastlike but is extremely polymorphic. This species is apparently not definitely affected by the insect's food plant. The rod-shaped symbiont is also polymorphic, but its polymorphism is governed apparently by the food plant of the insect. The systematic position of the symbionts cannot be determined without cultivation on artificial media, and this has not been accomplished. Congenital transmission of the symbionts is shown to occur in much the same manner as in *P. citri*, but in the case of *P. brevipes* aggregates of 'infection stages' which are themselves very small pass from the adult mycetome to the developing egg. Symbiosis is probably allied with nutrition as an ecological factor."

Control of pineapple mealy-bug wilt, F. B. SERRANO (*Philippine Jour. Sci., 56 (1935), No. 2, pp. 111–125, pls. 2*).—In continuation of the work previously noted (E. S. R., 73, p. 353), observations have shown that "pineapple mealybug wilt may be disseminated in a number of ways, namely, through infested plant material, such as suckers, slips, crowns, etc., through ants, and through the mealybug's own volition. Field tests have shown that the pineapple mealybug wilt may be controlled by spraying about once a month with 1.5 percent soap solution. The addition of pottery clay (about 0.2 percent), preferably the brown type, renders the solution more effective. Nicotine-soap solution and oil emulsion have proved to be practically as effective as soapsuds, if not more so, in killing the pineapple mealybug. Owing, however, to their scorching effect on plants, which is quite serious, particularly in the case of oil emulsions, their application is considered rather precarious. Hence, soap solution is considered preferable."

Tolerance of mealy bugs to drying of host tissue, L. B. UICHANCO (*Philippine Agr., 23 (1935), No. 10, pp. 886–890, figs. 2*).—The author reports upon two species of mealybugs, as follows: (1) *Pseudococcus lilacinus* Ckll., which was able to produce successive broods for 1 yr. on stored yam, even with the host material shrunken to dryness in the last part of the year, and (2) *Trionymus sacchari* (Ckll.), which lived on nongerminating cut stems for an average of 49.24 days. It is pointed out that the ability of certain coccid species to tide over dryness in host tissue presents peculiar problems in agricultural practice. This characteristic apparently furnishes an explanation for the presence in the Philippines of many immigrant species of mealybugs and scale insects.

The occurrence in the United States of Cryptococcus fagi (Baer) Dougl., the insect factor in a menacing disease of beech, J. EHRLICH (*Jour. Arnold Arboretum, 13 (1932), No. 1, pp. 75–80*).—A report of earlier observations than those noted (E. S. R., 72, p. 659).

Icerya purchasi in Concordia and its control by Novius cardinalis [trans. title], R. B. PIERES (*Bol. Min. Agr.* [*Argentina*], *36 (1934), No. 3, pp. 235–243, figs. 5*).—The invasion of the Concordia district of Argentina by the cottony-cushion scale and its combat by the vedalia are considered.

The association of the pyralid moth Tirathaba leucotephras Meyr. with the fruit bunches of the nipah palm (Nipa fruticans), G. H. CORBETT (*Malayan Agr. Jour., 23 (1935), No. 4, pp. 175–178*).—The author has found the pyralid moth *T. leucotephras* to be a secondary invader attracted to the gelatinous exudation in fruit bunches of the nipa palm and not of economic importance. The caterpillar is only present in a comparatively few female inflorescences, and when present rarely, if at any time, prevents the maturation of the fruit bunches. Neither is the weevil *Diocalandra frumenti*, which is attracted to fermenting sap, of importance.

Codling moth control a many-sided problem, S. W. HARMAN (*Farm Res.* [*New York State Sta.*], *1 (1935), No. 4, pp. 6, 7*).—The author presents a practical discussion of the codling moth problem in New York State, where repeated favorable insect years have gradually built up an enormous population of the pest in certain sections of the State, the present infestation being the most serious on record. Orchards in the State are now classified in three groups, namely, light, average, and severely infested, and are sprayed according to schedules designed for each group. The light infested plantings are found for the most part in the Hudson River and Champlain Valley districts. Western New York plantings are generally included in the second group, and the seriously infested plantings are found scattered through the western fruit belt, more especially in Niagara, Orleans, and Monroe Counties.

While lead arsenate continues to be the most efficient single insecticide for codling moth control, its combination with summer oil has proved more effective than lead arsenate alone and is recommended with certain precautions for use in severely infested plantings. The oil increases the adhesive properties of the spray, builds up a heavy residue, and when used in sufficient quantities acts as an ovicide. On the other hand, oil sprays are not compatible with sulfur fungicides and they make the problem of residue removal noticeably more difficult. Most other substances having insecticidal properties have been tested in the search for a substitute for lead arsenate with very little success. At the present time nicotine in the form of the so-called fixed nicotine compounds has given most promise, but this material has not as yet been perfected to the point where it can be generally recommended.

The importance of supplementary measures such as judicious pruning, thinning of fruit, prevention of crowding, use of chemically treated bands, etc., is emphasized. The removal of spray residue is also considered.

Codling moth studies: North Fork Valley of Colorado, J. H. Newton (*Colorado Sta. Bul. 414 (1935), pp. 47, figs. 5*).—The present contribution is a summary of laboratory studies and control work, with present control recommendations for the codling moth based upon studies conducted at Paonia, Delta County, during the past 16 yr., earlier results of which were given in Bulletin 268 (E. S. R., 46, p. 55).

It has been found that in the North Fork Valley and in similar mountainous districts from 40 to 60 percent of the first-brood larvae transform to first-brood moths. The "broods are distinct and well separated, in contrast with the overlapping of broods as in the Grand Valley. The moth population in the Austin-Cory district maintains a higher level than in the North Fork Valley. The districts of Montrose, Olathe, Redland Mesa, Cedaredge, Hotchkiss, and Morrisiana, near the town of Grand Valley, have similar codling moth activity as shown by trap records. The intensity of codling moth infestation may vary from season to season and within a given orchard.

"To obtain the greatest value from cover sprays it is essential to determine moth activity for each individual orchard and from it build a spray schedule to meet the problem. The use of lead arsenate is to be recommended in preference to any of the other materials which have been tested. A uniform coverage of lead arsenate can be obtained by the use of colloidal spreaders and neutral soaps and is to be preferred to the spot type of coverage. To avoid excessive run-off the amount of spreader should be held to the minimum. Arsenical sprays other than lead arsenate are not recommended because of their inefficiency in control and the danger of arsenical burning. Oil sprays in combination with lead arsenate have improved the control, but should not be used beyond the second cover spray because of danger of oil injury and the increased difficulty in the removal of lead and arsenical residues.

"Oil sprays in codling moth control have their greatest value as ovicides. They should be used at the peak of moth activity so as to come in contact with a large percentage of the eggs of the first brood. Mineral oils for summer sprays should be of a specific standard, manufactured by a reliable concern. Oil sprays should not follow delayed dormant or summer applications of lime-sulfur closer than 30 days because of danger of burning. Oil sprays in combination with lead arsenate should not be allowed to stand in tanks or pipes.

"Supplemental measures of control such as banding, cultivation, screening of cellars, and the destruction of hibernating larvae are important. To obtain the best results from the use of bands it is essential that the trees be properly prepared by the destruction of all hiding places. Medicated bands are to be

preferred to the untreated bands. 'Hooch' traps as a supplementary measure of control have not proved of value but are of great value in determining moth activity. Thinning can be employed to remove wormy fruits and to facilitate better spraying by the breaking of clusters. Judicious pruning is essential to thorough spraying."

Parasitism of the oriental fruit moth, with special reference to the importance of certain alternate hosts, W. R. HADEN (*Delaware Sta. Bul. 194 (1935), pp. 42, figs. 8*).—A brief introduction and a review of the literature is followed by a discussion of methods and materials (pp. 6–9) and of parasitism of the oriental fruit moth (pp. 9–18, 19, 20), of the ragweed borer *Epiblema strenuana* Walk. (pp. 18, 19, 20–28, 29), and of the strawberry leaf roller (pp. 28, 29–32, 33, 34). The parasites of these three species (pp. 32, 34–36) and the importance of the ragweed borer and the strawberry leaf roller as alternate hosts (pp. 36–38) are then taken up. The details of the author's study conducted during the 4-yr. period 1931–34 are presented in 17 tables.

The twig-infesting larvae of the first, second, and third broods of the oriental fruit moth were found to be destroyed to a large extent by parasites at practically every collection point in Delaware regardless of the presence or absence of the alternate hosts.

"The percentage of larvae of all broods of the oriental fruit moth destroyed by parasites was consistently high during the period in which this study was in progress. In 1931, 50.04 percent of the larvae were parasitized; in 1932, 57.90 percent; in 1933, 64.08 percent; and in 1934, 67.56 percent. *Macrocentrus ancylivorus was the most abundant parasite reared from the larvae of the* oriental fruit moth. It represented 88.35 percent of the total species reared in 1931; 80.31 percent in 1932; 94.54 percent in 1933; and 91.40 percent in 1934.

"Although *Cremastus minor* was second in importance to *M. ancylivorus*, it was not reared at all in 1931, and represented but 0.07 percent of the total species in 1933. In 1932, however, it amounted to 9.18 percent of the total species, and in 1934. 4.10 percent.

"No other parasite was recovered from this host in appreciable numbers.

"*First-brood larvae of the oriental fruit moth are available for adults of Glypta rufiscutellaris* which emerge from overwintered larvae of the ragweed borer and also for adults of *M. ancylivorus* which emerge from overwintered larvae of the strawberry leaf roller. The emergence period of *G. rufiscutellaris* extends from April 14 until May 9. Emergence of *M. ancylivorus* has been observed from May 7 to 16. The earliest and latest dates of emergence for the spring brood of the oriental fruit moth recorded, in Delaware, are April 5 and June 6, respectively.

"*However, G. rufiscutellaris has not been recovered from first-brood larvae* of the oriental fruit moth except in very small numbers. In 1931 and in 1934, it was not recovered at all, but in 1932 and in 1933 it represented 0.77 and 0.17 percent, respectively. Large numbers of *M. ancylivorus*, on the contrary, have been reared from this brood. In 1931, 88.89 percent of such larvae were parasitized by this species; in 1932, 76.40 percent; in 1933, 94.47 percent; and in 1934, 89.57 percent.

"Emergence of *M. delicatus* from overwintering larvae of the ragweed borer does not commence until *June 12. It continues until July 22. First-brood* oriental fruit moth larvae are not available, therefore, for this species. Only two specimens have ever been reared from this brood. Second-brood larvae of this host are, on the contrary, present in abundance at this time, and many specimens have consequently been recovered. Such records are limited, however,

to New Castle, the northernmost county in Delaware . . . and only two specimens from Kent County.

"Second-brood oriental fruit moth larvae, second-brood strawberry leaf roller larvae, and first-brood ragweed borer larvae are all available at approximately the same time, since the complete emergence period for adults of the broods producing these larvae extends from May 29 to July 24. The more important parasites of these three hosts are abundant during this period, with the exception of *G. rufiscutellaris*. . . . The last adult of this species died in the insectary on May 27, 1934, 42 days before the first larvae of the above-mentioned broods were available.

"Second-brood moths of the oriental fruit moth which produce both twig-infesting and fruit-infesting third-brood larvae, spring-brood ragweed borer moths which produce first, or summer-brood larvae, and second-brood strawberry leaf roller moths which produce third-brood larvae, and their parasites all occur at approximately the same time, that is, from July 25 to September 18.

"Fourth-brood larvae of the oriental fruit moth, which infest apples, are apparently unattacked by parasites. No recoveries have ever been made from such larvae in Delaware."

A study of the ragweed borer has shown that "in 1931, 63.81 percent of the larvae of the summer brood were parasitized; in 1932, 77.20 percent; in 1933, 71.35 percent; and in 1934, 75.75 percent. 85.34 percent of the larvae of the overwintering brood were similarly destroyed in 1934.

"*G. rufiscutellaris* and *M. delicatus* are the two most abundant parasites reared from the larvae of this host. *G. rufiscutellaris* represented 47.96 percent and *M. delicatus* 0.67 percent of the total parasites reared from the larvae of the overwintering brood in 1934. *G. rufiscutellaris* is the predominant species in the case of this brood, since *Bassus simillimus* and *Pristomerus ocellatus*, the two species next in importance, represented but 14.26 and 9.62 percent, respectively.

"No parasite showed an equal predominance upon larvae of the summer brood. *M. delicatus* represented 55.96 percent of the total species reared from the larvae of this brood in 1931; 24.24 percent in 1932; 18.50 percent in 1933; and 37.48 percent in 1934. *G. rufiscutellaris* amounted to 16.42 percent of the total parasites reared from the larvae of the summer brood in 1931; 22.30 percent in 1932; 39.55 percent in 1933; and 8.06 percent in 1934. The following parasites were also reared . . . in smaller but in fairly consistent numbers: *P. ocellatus*, *B. simillimus*, *Cremastus epagoges*, and *Lixophaga variabilis*.

"*M. ancylivorus* and *C. minor* have only been recovered from larvae of the overwintering and summer broods as occasional specimens."

A study of the strawberry leaf roller has shown that "in 1931, 38.55 percent of the larvae of this insect were destroyed by parasites; in 1932, 41.73 percent; in 1933, 36.85 percent; and in 1934, 47.17 percent. Except in 1934, when *Epirhyssalus atriceps* was first in importance, *M. ancylivorus* and *C. cookii* have been the two most abundant parasites reared from the larvae of this host. *M. ancylivorus* has been recovered from the larvae of all broods in large numbers in the Bridgeville area in southern Delaware. Strawberries are grown most extensively in this section of the State. Elsewhere it has been reared only as an occasional specimen. *M. ancylivorus* is more abundant upon the larvae of the second and third broods of this host than upon the first brood. *C. cookii*, on the other hand, is more abundant upon the first brood and less abundant upon the second and third broods."

It is pointed out that a total of 35 species of parasites were reared from larvae and pupae of the oriental fruit moth, the ragweed borer, and the straw-

berry leaf roller during the years 1931-34. Ten of these species were common to the oriental fruit moth and the ragweed borer, the larvae of which feed similarly within the stems of their respective host plants. But 6 species, on the contrary, were common to the oriental fruit moth and the strawberry leaf roller, and only 4 to the ragweed borer and the strawberry leaf roller. Three species of parasites (*M. ancylivorus*, *M. delicatus*, and *M. gelechiae*) were common to all three hosts.

It is concluded that the presence or absence of the two alternate hosts, the ragweed borer and the strawberry leaf roller, has had no appreciable effect thus far upon the natural control of the oriental fruit moth by parasites in Delaware.

The influence of unfavourable feeding conditions on the survival and fecundity of oriental fruit moths, G. G. Dustan (*Canad. Ent., 67 (1935), No. 5, pp. 89, 90*).—Feeding experiments with the oriental fruit moth here reported show that, as compared to favorable feeding conditions, the crowded condition of 10 eggs per apple produced (1) a much greater total mortality from egg to adult—47 percent as compared to 10.8 percent, (2) a similarly higher mortality during the pupation—23.5 percent as compared to 3.5 percent, and (3) a decrease in female fecundity from 39 to 14.5 eggs per female.

Notes on the hosts and parasites of some lepidopterous larvae, W. L. Putman (*Canad. Ent., 67 (1935), No. 5, pp. 105–109*).—Notes are presented on the food plants and parasites of numerous microlepidoptera that were collected and reared in the course of an attempt to discover the native hosts of the parasites of the oriental fruit moth.

Cacoecia rileyana Grote—an unusual occurrence (Tortricidae: Lepidoptera), J. S. Houser (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 105–107, pl. 1*).—The occurrence of *C. rileyana* in a pasture field near Xenia, Greene County, Ohio, where many of the shrublike trees were almost completely encased with glistening snow-white webs, is reported. Most of the larvae when observed on May 30, 1934, were about an inch long and nearly full grown, and were secreted in masses of webbed foliage. Ohio buckeye (*Aesculus glabra*) was the preferred host, although hickory (*Hicoria* sp.) was consumed with almost equal avidity. Hazelnut (*Corylus americana*) was less seriously damaged, whereas black walnut (*Juglans nigra*) and American elm (*Ulmus americana*) were avoided. Three species of parasites were reared from the larvae, namely, *Itoplectis conquisitor* (Say), *Brachymeria ovata* (Say), and *Bassus agilis* (Cress.).

Progress report on orange worm control, A. J. Basinger and A. M. Boyce (*Calif. Citrogr., 20 (1935), No. 6, pp. 158, 178, 179*).—The progress of control work with the orange tortrix at the California Citrus Experiment Station (E. S. R., 61, p. 351; 65, p. 756) is reported.

The effect on citrus of the application of the readily available fluorine compounds, applied as sprays and dusts at various concentrations and with various adhesive agents, were studied by Boyce in 1929 and 1930. These tests showed that "sodium fluoaluminate (cryolite), potassium fluoaluminate, barium fluosilicate, barium fluoride, calcium fluosilicate, and calcium fluoride could be used with safety to the tree. The other fluorines tested caused some injury, which varied from small obscure pits in the rind of the fruit to complete defoliation of the tree and depended primarily upon the solubility of the compound in water."

The studies were again taken up and have been continued since October 1933. The rather extensive work in the field to date, here reported upon in four tables the details of which will appear in bulletin form, shows that orange worms may be satisfactorily controlled through the use of either cryolite (sodium fluoaluminate, synthetic or natural) or barium fluosilicate.

Two new bird ceratophylli from Minnesota (Insecta: Siphonaptera), C. Y. Liu (*Ann. Ent. Soc. Amer., 28 (1935), No. 1, pp. 121–125, figs. 6*).—Descriptions of *Ceratophyllus swansoni* n. sp., taken from *Asio wilsonianus*, and *C. rileyi* n. sp., taken from the ruffed grouse (*Bonasa umbellus*), both in Minnesota, are contributed from the Minnesota Experiment Station.

The varieties of Anopheles maculipennis and their relation to the distribution of malaria in Europe, L. W. Hackett and A. Missiroli (*Riv. Malariol., 14 (1935), No. 1, pp. 45–109, pls. 4; Ital. abs., p. 105*).—The authors' studies have led to the conclusion that the egg type provides the only convenient and satisfactory method of dividing *A. maculipennis* into a number of constituent varieties. It is pointed out that there are only two other morphological characters of any value for identification purposes, and that these show such a paucity of forms with so much overlapping that they are not sufficient in themselves for the classification of any given specimen. The authors have found that the egg type is linked with the other characters, structural and biological, which distinguish the varieties wherever they are found. The five varieties of *A. maculipennis*, as identified by their eggs, are each found in a number of different areas which are widely separated geographically.

"The behavior of the varieties may differ widely, depending as it does on inherited instincts and adaptations, but it is also subject to environmental and microenvironmental influences, in some races more than in others. Either or both factors may determine the degree of its contact with man and its role in the spread of malaria. There are three varieties, however, [*A. maculipennis*] *typicus*, [*A. maculipennis*] *messeae*, and [*A. maculipennis*] *melanoon*, which are apparently associated with malaria transmission only under exceptional circumstances, although their range and numbers exceed those of any other subspecies. Two others ([*A. maculipennis*] *labranchiae* and [*A. maculipennis*] *elutus*) have been found to be always dangerous vectors of malaria, even under microclimatic conditions which would be considered extremely unfavorable and in certain cases intolerable to other forms. The sixth variety ([*A. maculipennis*] *atroparvus*) occupies an intermediate position, being in the main tied by instinct or physiology to stabular conditions, but able under certain circumstances to invade dwellings and obtain human blood so frequently and regularly as to support a mild endemic malaria. There is thus a definite relation between the geographical distribution of the varieties and that of malaria."

A 4-page list of references to the literature is included.

The insectary rearing of Anopheles quadrimaculatus, M. F. Boyd, T. L. Cain, Jr., and J. A. Mulrennan (*Amer. Jour. Trop. Med., 15 (1935), No. 3, pp. 385–402, figs. 7*).—The details are given of practices originally worked out with *A. quadrimaculatus* that have been found equally applicable without modification to the successful maintenance of a colony of *A. punctipennis*.

Notes on the southern buffalo gnat Eusimulium pecuarum (Riley) (Diptera: Simuliidae), G. H. Bradley (*Ent. Soc. Wash. Proc., 37 (1935), No. 3, pp. 60–64, figs. 5*).—Brief notes on the history and occurrence of *E. pecuarum* are followed by an account of its habits, a description of the egg, and a redescription of the male.

A study of Medetera aldrichii Wh. (Diptera-Dolichopodidae), a predator of the mountain pine beetle (Dendroctonus monticolae Hopk., Coleo.-Scolytidae), D. De Leon (*Ent. Amer., n. ser., 15 (1935), No. 2, pp. 59–91, figs. 4*).—The author has found *M. aldrichii* to be the most important predator of the mountain pine beetle which infests lodgepole and western white pine, it probably destroying from 40 to 50 percent of the brood of this beetle.

"The life cycle varied from about 2 to 12 mo.; the incubation period ranged from 10 to 14 days; the larval period ranged from 1 to about 11 mo.; and the

pupal period ranged from 14 to 17 days. The fly oviposits chiefly in trees recently attacked by the mountain pine beetle.

"Spring or fall control of the brood of the mountain pine beetle by either the burning or peeling method destroys practically all of the brood of *M. aldrichii*. Fall control, however, is probably better in the lodgepole pine stands as it destroys fewer of the brood of the most beneficial parasite, the braconid *Coeloides dendroctoni* Cush."

A list of 40 references to the literature is included.

A hormone causing pupation in the blowfly Calliphora erythrocephala, G. Fraenkel (*Roy. Soc.* [*London*], *Proc., Ser. B, 118* (*1935*), *No. 807, pp. 1–12, pl. 1, fig. 1*).—In this contribution proofs have been established for the action of a hormone inducing pupation in the blowfly *C. erythrocephala*. "This hormone is secreted from 16 hr. before pupation at 20° C. The hormone-producing organ is either the 'ganglion' or in its immediate neighborhood. After the hormone has already been discharged, pupation can be successfully accomplished without the cooperation of the nervous centers (ganglion). The atmospheric oxygen required for the darkening of the pupa is brought to the skin through the tracheal system."

Some North American parasites of blowflies, R. A. Roberts (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 6, pp. 479–494, figs. 3*).—Investigations of parasites and predators of blowflies conducted at Uvalde, Tex., and data on the distribution of *Alysia* and *Psilodora* in California, Arizona, and New Mexico are reported. Blowflies breeding in carcasses are said to be affected by the following factors: (1) Destruction of the carrion by man or animals, (2) environmental and physiological conditions, (3) destruction of maggots by parasites and predators, and (4) competition between the species of Diptera. Hymenopterous parasites are most active in small carcasses such as rabbits, turtles, and birds.

"Species of the genera *Alysia*, *Psilodora*, *Xyalosema*, and *Brachymeria* attack blowfly larvae. These species deposit their eggs within the bodies of fly maggots and produce but a single parasite in each host. *Brachymeria* and *Alysia* breed most readily in *Sarcophaga*, but are reared also from *Calliphora*, *Lucilia*, and other blowflies. *Psilodora* and *Xyalosema* have a wider range in host selection and breed to some extent in *Cochliomyia*. *Alysia* and *Psilodora* were found in abundance in the Southwestern States, although occasional eastern and northern records are known. *Brachymeria* were found throughout the southern and central parts of the United States. *Xyalosema* is mainly of eastern distribution, although one species is found in the Texas coastal region. All of these parasites are of value because of the extent of their parasitism of blowfly larvae in carcasses. Especially important are those known to attack *Cochliomyia*.

"Of the parasites which affect blowfly pupae, *Mormoniella*, is the most important. *Aphaereta* and *Trichopria* are commonly encountered. These parasites produce a number of offspring in a single host pupa and may easily be reared in large numbers under laboratory conditions. Their effectiveness in blowfly control is not great, however, because most fly larvae pupate in the soil where they are well protected from parasites."

A list of 12 references to the literature is cited.

Biological study of the walnut husk fly (Rhagoletis suavis Loew), D. T. Ries (*Mich. Acad. Sci., Arts, and Letters, Papers, 20* (*1934*), *pp. 717–724, pls. 3*).—Observations made of *R. suavis* in Michigan, where only the black walnut (*Juglans nigra*) and the butternut (*J. cinerea*) serve as hosts of this pest (the former being by far the more common host) are reported.

A contribution toward the knowledge of the frit fly, S. KÉLES (*Prace Wydz. Chorób Roślin Państ. Inst. Nauk. Gosp. Wiejsk. Bydgoszczy, No. 14 (1935), pp. 79–86, pl. 1; Eng. abs., p. 85*).—Observations of the biology of the frit fly in Poland, where there are three generations each year, are reported.

The lantana seedfly in India (Agromyza (Ophiomyia) lantanae Froggatt), T. V. SUBRAMANIAM (*Indian Jour. Agr. Sci., 4 (1934), No. 3, pp. 468–470, pl. 1*).—Attention is called to the fact that the well-known lantana seed fly of Hawaii is now widely distributed in different parts of India. It may become of importance there by attacking the seed of the noxious plant *Lantana camara*, which overruns uncultivated waste, grazing, and forest lands.

A study of the beet fly in Belgium in 1934 [trans. title], L. DECOUX and G. ROLAND (*Inst. Belge Amélior. Betterave Pubs., No. 3 (1935), pp. 121–130; Fr., Dutch, Ger., Eng. abs., pp. 129, 130*).—This is a further study (E. S. R., 73, p. 214) of *Pegomyia hyoscyami* Panz. var. *betae* Cur., injury by which decreased in 1934. The percentage of parasitism of the larva increased over that of the preceding year and attained 38 percent in the first generation. The parasites observed were *Opius fulvicollis*, *O. nitidulator*, and *O. spinaciae*, the first two being by far the most active. A sulfurous disinfectant of the soil proved to be efficacious against the pupae hibernating in the open fields.

The extent of infestation of the cederate (Citrus medica) with the fruit fly C[eratitis] capitata in Palestine, E. RIVNAY (*Hadar, 8 (1935), No. 2, pp. 49–52, figs. 2*).—In an examination in groves and in the laboratory in Palestine of fruit of the cederate, which is imported into the United States especially from Mediterranean countries, no larvae of the Mediterranean fruit fly were found in the pulp, and the live larvae found in the rind were small, recently hatched, and would have died before reaching the pulp. It was found that where there is infested fruit, the mortality of the eggs and larvae reaches 99.8 percent.

Fruit flies and their economic importance in S. India, T. V. RAMAKRISHNA AYYAR (*Madras Agr. Jour., 23 (1935), No. 4, pp. 127–137, pls. 2*).—This discussion includes an annotated list of the fruit flies and their parasites, noted from south India, and a list of 12 references to the literature.

Notes on the biology and control of Neosciara ocellaris (Comstock) (Diptera, Sciaridae), L. O. ELLISOR (*Iowa State Col. Jour. Sci., 9 (1934), No. 1, pp. 25–36, fig. 1*).—This is a report of a study of the biology of a sciarid, *N. ocellaris*, common in greenhouses at Ames, Iowa, and thought to occur in every State. In an investigation it was found that the maggots were causing considerable damage to greenhouse plants. While it appears throughout the year in greenhouses, it is more abundant there during winter and spring; it also appears out-of-doors during the warmer months of the year. At 25° C. and a high relative humidity (nearly 100 percent), the eggs hatch in from 4 to 5 days. The larvae complete their development in from 11 to 15 days.

It was found that the maggots can be controlled in the soil "by drenching the soil with a mercuric chloride solution at a concentration of 1 oz. to 8 gal. of water, and with a mercurous chloride suspension at a concentration of 3 oz. to 10 gal. of water. They can also be kept in check by allowing the soil to dry out occasionally."

A list is given of 31 references to the literature.

Notes on the habits of attack of the hemlock borer, R. E. BALCH (*Canad. Ent., 67 (1935), No. 5, pp. 90–92*).—It is concluded that the buprestid beetle *Melanophila fulvoguttata* Harr. is unlikely in Nova Scotia to attack healthy timber, having failed to do so under favorable circumstances. Its attack has been confined to trees recently cut, dying, or which have been seriously weakened.

The control of Phyllopertha horticola L. in grassland, C. L. WALTON (*Jour. Bath and West and South. Counties Soc., 6. ser., 9 (1934–35), pp. 140–148, fig. 1*).—In control work conducted on 20 acres of grassland seriously infested with the larvae of *P. horticola*, surface dressings of crude naphthalene applied at the rate of 2 cwt. per acre in early October 1933 effected a marked reduction of the larvae for that season. "Further field trials and observations carried out during 1934 showed that the adult beetles preferred hay grass to land closely grazed; they failed to oviposit on land mown at the commencement of their flight period. A trial using 56 lb. per acre of flowers of sulfur applied as a surface dressing to meadow and pasture grass as a deterrent to oviposition yielded results of an indeterminate character."

The attraction of Necrobia rufipes De Geer (the copra beetle) to the fatty acids of coconut oil and to types of copra, G. H. CORBETT, M. YUSOPE, and A. HASSAN (*Malayan Agr. Jour., 23 (1935), No. 5, pp. 217–228, pl. 1*).—It is pointed out that the red-legged ham beetle "is attracted most to slimy, wet, moldy copra and more to slimy, dry than to slimy, wet copra. It shows little attraction toward good dry copra. *Carpophilus dimidiatus* F. (mostly) and *Silvanus advena* Walk. are most attracted to slimy, moldy copra. *Necrobia* appears to be attracted more to lauric and myristic than to the other fatty acids of coconut oil and to the mixed fatty acids than to the oils of coconut and palm kernel. *S. advena* is attracted to oleic acid in large numbers, but *N. rufipes* is not sufficiently attracted to recommend the employment of the acid as a control for this beetle. It is suggested that *N. rufipes* is attracted to the decomposition products in copra as a result of bacterial or fungoid activity. Traps and fumigation are not recommended for the control of insects associated with copra. The production of good copra in Malaya is favored."

Notes on the habits of certain coprophagous beetles and methods of rearing them, A. W. LINDQUIST (*U. S. Dept. Agr. Circ. 351 (1935), pp. 10, figs. 2*).—A method of rearing coprophagous or dung beetles is described, followed by an account of the habits of various species, including *Copris remotus* Lec., *Phanaeus triangularis* (Say), *Canthon laevis* (Drury), *C. lecontei* Har., *C. cyanellus* Lec., *Onthophagus anthracinus* Har., *O. pennsylvanicus* Har., *Pinotus colonicus* (Say), *Aphodius* spp., and *Ataenius* spp.

Notes on the life histories of four of the most common species are given. The average period of development of *C. remotus* was 49 days from egg hatching to adult emergence, *P. triangularis* 344 days, *C. laevis* 35.4 days, and *O. anthracinus* 38.4 days. *C. remotus* females remain in the nest with from 4 to 6 egg balls until the progeny matures. *P. triangularis* place their egg balls singly in burrows and then desert them. *C. laevis* roll dung balls above ground before burial.

Dung beetles are also attracted to carcasses and decayed meat. They are frequently found in bait pans of blowfly traps in southwestern Texas. It is pointed out that because of their disturbance of cattle dung, the breeding medium of the horn fly, dung beetles are believed to act as a natural control of this pest.

A forest insect problem, J. C. EVENDEN (*Idaho Forester, 17 (1935), pp. 12, 13, fig. 1*).—The importance of the mountain pine beetle in stands of western white pine and its control are emphasized in this brief account.

The starch content of some Australian hardwoods in relation to their susceptibility to attack by the powder post borer Lyctus brunneus Stephens, J. E. CUMMINS and H. B. WILSON (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 2, pp. 101–110*).—The results of the laboratory experiments and of the examination of infested samples definitely indicate that the presence

of starch in the sapwood is essential for infestation by *Lyctus*. There appears to be a limiting starch content, which is, however, very small and can be designated as a trace. No attack apparently occurs unless the starch concentration is equivalent to slight or more. In general, the greater the starch content the greater the extent of damage that is likely to occur.

A new scolytid beetle found in the bark of lemon trees (Coleoptera, Scolytidae), W. EBELING (*Pan-Pacific Ent., 11 (1935), No. 1, pp. 21–23, figs. 2*).—Under the name *Hypothenemus citri* n. sp. the author describes a very small scolytid beetle found by the California Citrus Experiment Station burrowing in the dead bark and sapwood of lemon trees in a grove near Orange, Calif.

Report of bark beetle campaign after storm damage, 1931–32 [trans. title], I. TRÄGÅRDH and V. BUTOVITSCH (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 28 (1935), pt. 1, pp. 268, figs. 60; Ger. abs., pp. 240–268; abs. in Jour. Forestry, 33 (1935), No. 7, pp. 701, 702*).—This is a report of studies of insect damage to fallen timber in Sweden following unusually intense storms in 1931 and 1932. The effectiveness of the measures undertaken to minimize losses and other data, presented in detail in table form, are dealt with.

Studies on the pea weevil in Hokkaido.—I, Spraying experiments during the young pod stage of pea-plant, S. KUWAYAMA and K. ENDO (*Hokkaido Agr. Expt. Sta. Rpt., 34 (1935), pp. 43–59+[1], pl. 1; Eng. abs., p. [1]*).—In control work with the pea weevil sprays of the rotenone group, such as derris soap and Neoton soap solutions, proved to be the most effective.

Packages vs. overwintered colonies, C. H. GILBERT (*Gleanings Bee Cult., 63 (1935), No. 3, pp. 138–140, figs. 3*).—A brief discussion contributed from the Wyoming Experiment Station.

A disease of young bees caused by a Mucor, C. E. BURNSIDE (*Amer. Bee Jour., 75 (1935), No. 2, pp. 75, 76, figs. 2*).—In the course of the author's study of bee diseases caused by fungi (E. S. R., 62, p. 759), several species of *Mucor* were observed growing on dead adults. The most common of these, which was not specifically distinct from *M. hiemalis* Wehmer-Hagem, was also found growing within the digestive tract and muscle tissues of sick bees. The experiments conducted and here reported have led the author to conclude that *M. hiemalis* is pathogenic for young adult bees when they are exposed to a temperature of about 68° F. It is thought that the natural infection of a small percentage of young bees is due to the fact that *M. hiemalis* is an ubiquitous species constantly present about beehives. Normally the loss of bees due to natural infection by this fungus appears to be of but little importance. When bees are old enough to leave the hive they are no longer susceptible, and young bees almost always remain on the brood combs, where the temperature is several degrees above that at which the fungus can attack them. Should young bees be exposed to temperatures near 68°, however, some of them might be killed by *M. hiemalis*.

The comparative action of the venom of bees on vertebrates, and in particular on the venomous species [trans. title], M. PHISALIX (*Ann. Sci. Nat., Zool., 10. ser., 18 (1935), pp. 67–95*).—Following an account of the technic employed, the author reports upon the action of the venom of bee stings upon man and the mammals, birds, reptiles, batrachians, and fish. A brief reference is then made to the immunity of the hedgehog.

Bee venom therapy: Bee venom, its nature, and its effect on arthritic and rheumatoid conditions, B. F. BECK (*New York and London: D. Appleton-Century Co., 1935, pp. XV+238*).—Part 1 of this work deals with theoretical consideration (pp. 1–122) and part 2 with arthritic and rheumatoid conditions—apitherapy (pp. 123–216). A composite bibliography, an authors' index, and a general index are included.

Brachymeria intermedia (Nees), a primary parasite, and B. compsilurae (Cwfd.), a secondary parasite, of the gypsy moth, P. B. Dowden (*Jour. Agr. Res. [U. S.], 50 (1935), No. 6, pp. 495–523, figs. 5*).—A study of *B. intermedia*, a European chalcidid parasitic on the gypsy moth pupae as well as many other species of Lepidoptera, and *B. compsilurae*, a parasite of tachinid flies and apparently native to North America, conducted at Melrose Highlands, Mass., in 1924, 1932, and 1933, and of *B. intermedia* at the gypsy moth European sublaboratory in Budapest, Hungary, in 1929 and 1930, is reported.

As a parasite of the pupa of the gypsy moth, *B. intermedia* is of primary importance in Sicilia (Sicily), Algeria, and Morocco and is a minor factor in the more northern latitudes of central Europe. The winter is spent as an adult. Two, and possibly 3, generations are completed in a season. Oviposition occurs in the host pupa, and development requires from 18 days in the summer to 62 days in the fall. The egg is of the conventional type. There are 5 larval instars. The first instar closely resembles typical external feeding chalcidoid larvae, and the advanced larval instars do not differ greatly from the first instar.

B. compsilurae is particularly destructive to the tachinids *Compsilura concinnata* and *Sturmia scutellata*, which are European species successfully established in New England against the gypsy moth. The winter is spent as a full-grown larva within its host puparium. From 1 to 3 generations are completed in a season according to the number of generations of the host. Oviposition occurs through the primary lepidopterous host larva or pupa. Development from egg to adult requires from 23 to 31 days. The egg is unusual in that a clear hyaline membrane encloses an egg body of the conventional type. There are 5 larval instars. The first instar larva is typical of the caudate form of internal feeding chalcidoid larvae. The advanced instars change considerably owing to the gradual loss of the tail. The full-grown larva is unusual in having 6 sclerotic plates below the spiracles of abdominal segments 2 to 7, inclusive.

A list of 30 references to the literature is included.

Parasites of the golden oak scale: The establishment in New Zealand of Habrolepis dalmanni Westw., E. S. Gourlay (*New Zeal. Jour. Sci. and Technol., 16 (1935), No. 4, pp. 216–235, figs. 9*).—The introduction from the United States and the establishment in New Zealand of *H. dalmanni*, a small chalcid parasite of the pustular scale (*Asterolecanium variolosum* (Ratz.)) on the golden oak (*Quercus pedunculata*), is reported upon. It is said to have taken 12 seasons of work, attended by several failures in establishment, to bring *H. dalmanni* to its present status, when it may be claimed definitely to be controlling the pustular scale.

Three new reared parasitic Hymenoptera, with some notes on synonymy, C. F. W. Muesebeck (*Jour. Wash. Acad. Sci., 25 (1935), No. 6, pp. 279–283*).—*Telenomus catalpae*, Takoma Park, Md., reared from eggs of *Ceratomia catalpae* Bdv.; *Apanteles epiblemae*, Meade County, Kans., parasite of *Epiblema strenuana* Walk.; and *A. thujae*, Bar Harbor, Maine, parasite of *Recurvaria thujaella* Kearf., are described as new.

The plum fruit sawfly and its control, H. W. Miles (*Jour. Min. Agr. [Gt. Brit.], 42 (1935), No. 2, pp. 129–133, pls. 3*).—In spray control experiments with *Hoplocampa flava* L. in north Lancashire, two applications of a spray containing 8 oz. of nicotine and a spreader in 100 gal. of water gave a marked reduction in the infestation of the pest. The applications should be timed to coincide with the hatching of the eggs, since only a small proportion of them become exposed during incubation.

Parthenogenesis among the acarids [trans. title], M. ANDRÉ (*Ann. Sci. Nat., Zool., 10 ser., 18 (1935), pp. 103–118*).—This is a review of the subject, presented with a list of 46 references to the literature.

Development and morphology of the cestode Hymenolepis cantaniana in coleopteran and avian hosts, M. F. JONES and J. E. ALICATA (*Jour. Wash. Acad. Sci., 25 (1935), No. 5, pp. 237–247, figs. 10*).—Early developmental stages of proliferating larvae of the poultry cestode *H. cantaniana* were obtained from five specimens of the beetle *Ataenius cognatus* (E. S. R., 69, p. 287), dissected at varying periods after having been fed the cestode eggs.

"On the basis of the experimental findings, the minimum time required for development of an infective larva in the beetle host is from 11 to 14 days; proliferation of the larva and development of new cysticercoids apparently may continue for at least 4 weeks. Development of the adult worm in the chicken requires at least 14 days, and the time probably varies from 2 to 3 weeks. Twelve chickens, 1 quail, and 1 guinea fowl became infested with *H. cantaniana* as a result of feeding branched cestode larvae obtained from naturally infested specimens of the beetle *A. cognatus*. The beetles *Choeridium histeroides* and *A. stercorator* are reported as additional intermediate hosts, on the basis of their harboring larvae similar to those found in *A. cognatus* and known to be larvae of *H. cantaniana*."

The bearing of the physiology of parasitic nematodes on their treatment and control, G. LAPAGE (*St. Albans, Eng.: Imp. Bur. Agr. Parasitol., 1935, pp. 21*).—This discussion is presented with a list of 16 references to the literature.

Synopsis of the Paramphistomoidea [trans. title], L. TRAVASSOS (*Mem. Inst. Oswaldo Cruz, 29 (1934), No. 1, pp. 19–178, pls. 2, figs. 80*).—This illustrated synopsis of the trematodes of the superfamily Paramphistomoidea, with the habitats and geographical distribution of the species, includes a host list, an index, and a 7-page list of references to the literature.

A morphological and biological study of the trematode Sellacotyle mustelae n. g., n. sp., F. G. WALLACE (*Jour. Parasitol., 21 (1935), No. 3, pp. 143–164, pls. 2, figs. 15*).—In this contribution from the Minnesota Experiment Station the author describes a new trematode parasite found in nature in the mink (*Mustela vison*) under the name *S. mustelae*. This minute species, which has been collected from the intestines of the mink, has also been reared experimentally in the mink, dog, cat, rat, ferret, fox, raccoon, and skunk. No marked pathogenic effect has been noted in any of these hosts.

"This parasite appears to be closely related to but not congeneric with the salmon poisoning fluke, *Nanophyetus salmincola* of the family Troglotremidae. For the two genera *Nanophyetus* and *Sellacotyle* the subfamily Nanophyetinae is erected.

"The cercariae develop in the snail *Campeloma rufum*. They are microcercous, armed forms possessing a prominent mucous gland near the posterior end. They penetrate and encyst in a wide variety of fish, but the most favorable host appears to be *Ameiurus melas*."

Ticks and the role they play in the transmission of diseases, F. C. BISHOPP (*Smithsn. Inst. Ann. Rpt., 1933, pp. 389–406, pls. 9, fig. 1*).—A practical account.

ANIMAL PRODUCTION

Growth and development with special reference to domestic animals, XXXV XXXVI (*Missouri Sta. Res. Buls. 222 (1935), pp. 40, figs. 9; 223 (1935), pp. 20, figs. 2*).—This series of studies is continued (E. S. R., 72, p. 823).

XXXV. *Energetic efficiency of milk production and the influence of body weight thereon*, S. Brody and R. C. Procter.—The distribution of dietary digestible nutrients between milk production, maintenance cost, and gain in live weight was determined by statistical methods for 243 mature Holstein, Jersey, and Guernsey cows. The results showed that 0.305 lb. of total digestible nutrients was required to produce 1 lb. of fat-carrying milk, 2.1 lb. of total digestible nutrients to gain 1 lb. of live weight, and 0.053 lb. of total digestible nutrients to maintain 1 lb. of live weight at body weight 1 lb. if it were assumed that maintenance cost increases with body weight raised to the 0.73 power.

From these data the following conclusions were drawn: "(1) The net digestible feed energy cost of milk production (not counting maintenance cost or live weight gain cost) is about 1.6 times the milk energy, or the net (or partial) energetic efficiency (ratio of milk energy to digestible feed energy less maintenance energy) is about 60 percent. (2) The gross digestible feed energy cost of milk production (including maintenance cost) is about 3 times the milk energy, or the gross (or overall, or total) energetic efficiency of milk production (ratio of milk energy to total digestible feed energy) is about 30 percent (exact value depending on milk yield). (3) The digestible energy cost of maintenance is about 2.4 times the basal (energy) metabolism. All these conclusions are but rough approximations to the true values because the basic data are not homogeneous."

The gross efficiency of milk production in a given group of cattle declined with increasing live weight. While this decline was statistically significant, it was not physiologically significant. Evidence indicates that larger cows tend to be fed more liberally than smaller cows, and that efficiency tends to decrease with increasing plane of nutrition.

Appended is a brief review of the literature and individual records of the experimental cows.

XXXVI. *Endogenous nitrogen and basal energy relationships during growth*, U. S. Ashworth.—It was found that weanling rats excreted less than 1 mg of endogenous urinary nitrogen per Calorie of basal metabolism. Adult rats under the same conditions excreted about 1.5 mg of endogenous urinary nitrogen per Calorie. On this basis the nitrogen-Calorie ratio increased with increasing age during growth.

Two methods were used for measuring the minimum endogenous nitrogen excretion of growing rats, and comparable results were obtained when the maximum urinary nitrogen excretion was related to the initial body weight or basal heat production. Variations in the endogenous nitrogen excretion may account for differences in reported biological values of proteins.

Using Smuts' method, in which endogenous nitrogen is collected between the seventh and thirteenth days on a nitrogen-poor diet, rats weighing over 100 g taken from a high-protein diet (30 percent) excreted 26 percent more nitrogen per unit of body weight than their paired litter mates taken from a low-protein diet (13 percent). High-protein animals produced 7.6 percent less basal heat per unit of body weight than their paired low-protein mates.

The relation between the basal metabolism and the endogenous nitrogen metabolism, with particular reference to the estimation of the maintenance requirement of protein, D. B. Smuts (*Jour. Nutr., 9 (1935), No. 4, pp. 403–433*).—Investigations at the Illinois Experiment Station, using the mouse, rat, guinea pig, rabbit, and pig as experimental animals, showed that the smaller the body size, the more rapid was the adjustment to the postabsorptive condition during fasting and the more rapid was the adjustment to the endogenous level of nitrogen excretion in the urine during specific nitrogen starvation.

The total endogenous nitrogen output of warm-blooded animals varied more nearly with the body surface than with the body weight.

A close relationship was found between the total endogenous nitrogen excretion of warm-blooded animals varying widely in size, and their basal metabolism was such that 2 mg of nitrogen were lost to the body daily for every calorie of basal heat. The endogenous catabolism of an animal, regardless of species, could be estimated from its basal heat production as accurately as the latter could be estimated from its body surface or body weight. The estimate of endogenous loss of nitrogen was the basic information required to compute the maintenance requirement of protein.

Within a species there was a fairly constant relationship between the excretion of creatinine and basal metabolism, but there was no constant relationship among different species in this respect. This was due to the fact that, in different species the smaller the body size the smaller was the percentage of the total endogenous nitrogen represented in the creatinine output.

The effects of lactose on growth and longevity, E. O. Whittier, C. A. Cary, and N. R. Ellis (*Jour. Nutr., 9 (1935), No. 4, pp. 521–532, figs. 5*).—Feeding experiments with rats and pigs were carried out by the U. S. D. A. Bureaus of Animal Industry and Dairy Industry to determine the effect of lactose feeding on the growth of young animals, on the body weights of adult animals, and on longevity. Comparisons were made of the body composition of animals fed lactose with that of animals fed other carbohydrates.

Lactose caused more rapid growth of young rats than did sucrose, but adult rats became heavier on a sucrose ration than on a lactose ration when fed ad libitum. The difference was attributed to a greater accumulation of fat in the bodies of the sucrose-fed animals. Lactose-fed rats generally lived longer than sucrose-fed rats. Feeding excessive quantities of lactose to rats caused diarrheal conditions and retardation of growth for a short period, after which the disadvantage was practically overcome. Pigs fed sucrose accumulated a greater proportion of fat than those fed lactose. The characteristic results obtained on rate of growth when lactose rations were fed were not explainable on the basis of stimulation of acidophilic organisms in the lower intestine, since dextrin did not have the same influence on growth as did lactose.

It is suggested that these results may be directly applicable to human nutrition.

A growth deficiency disease, curable by wheat germ oil, H. Blumberg (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 227–238, figs. 2*).—Rats were fed a highly purified diet made up of protein, carbohydrate, salts, and yeast in a fat-free state, supplemented with vitamins A and D, and the essential unsaturated fatty acid in a practically pure form. This diet did not promote normal early or middle growth. Feeding female rats for from 40 to 50 weeks on it produced a deficiency disease marked by a significant loss in weight, loss of vigor, emaciation, muscular disturbances, and a general lack of well-being. In this state the females showed a disturbance in the oestrus cycle, with a cessation of ovulation. The condition was readily curable by the addition of either wheat germ, wheat germ oil, or egg yolk. The preparation of active concentrates by extraction with ether and other fat solvents indicated the vitaminlike nature of the beneficial factor, which in distribution and general properties resembled vitamin E.

One of two conclusions seemed justified on the basis of these results—(1) that vitamin E is necessary not only for reproduction and late growth stimulation but also for normal early and middle growth and for maintenance and well-being, or (2) that wheat germ oil contains an unrecognized fat-soluble growth factor. Some evidence supports the latter view.

Nutritive value of pasture.—XI, The composition and nutritive value of winter pasturage, H. E. Woodman and P. M. Oosthuizen (*Jour. Agr. Sci. [England], 24 (1934), No. 4, pp. 574–597*).—Continuing these studies (E. S. R., 71, p. 682), the yield, composition, and digestibility of winter pastures produced under the most favorable conditions were determined.

Herbage produced from the end of July to December was leafy in character and varied from 4 to 9 in. in height. Compared with spring grass of similar botanical composition, it was poorer in protein, lime, and phosphoric acid and richer in fiber and nitrogen-free extracts. Its digestibility and nutritive value were also lower. The inferior composition and nutritive value were due to cessation of growth as a result of cold and frost, accompanied by a reorganisation of the plant materials to meet inclement conditions.

The grass produced from the end of August to January was a leafy growth, 2 to 4 in. in height. It appeared to withstand the effects of frost more successfully than similar grass at a more advanced stage of growth. Its protein content was higher than that of December grass, but compared unfavorably in composition, digestibility, and starch equivalent with spring grass.

Grass produced from the end of September to February consisted of short, leafy herbage from 1.5 to 3 in. in height. This grass was distinctly less affected by frost than older, longer grass. Digestion trials indicated that less lignin had developed, and this was accompanied by improvement in the digestibility of the other constituents.

The grass produced from the end of October until March was wholly leafy in character, and only 1.5 to 2 in. high. In composition, digestibility, and starch equivalent it closely approximated the short, leafy pasturage produced during the normal pasture season. It was felt that this satisfactory composition was due to the fact that winter conditions caused a smaller deterioration in composition and feeding value of the short, leafy grass, and that the improved composition and digestibility were the earliest manifestations of the growth impulse that became quite evident later in the spring.

While the herbage produced during the periods September to February and October to March had the best composition and feeding value, the yields were too low to have any significance in farming practice. Winter herbage was definitely less palatable than spring or summer grass, and this was attributed to the browning effect of frost. As a result of this study it is concluded that both the visible effects of frost and the loss of palatability were less drastic with short, leafy grass than with more mature grass.

New information about livestock and poultry, C. I. Bray, M. G. Snell, C. W. Upp, and R. H. Lush (*Louisiana Sta. Bul. 262 (1935), pp. 85*).—This bulletin summarizes 6 years' results of experimental work with beef cattle, swine, sheep, mules, poultry, and dairy cattle.

[Investigations with livestock by the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 19, 20, 74, 75*).—Studies with sheep yielded information on the comparative efficiency of lambs in utilizing feeds, by R. W. Phillips.

In poultry tests data are reported on breeding poultry for egg production, by F. A. Hays and R. Sanborn, and breeding for high and low resistance to fowl paralysis, by Hays, C. S. Gibbs, W. C. Sanctuary, and J. H. Vondell.

[Livestock investigations in Nebraska] (*Nebraska Sta. Rpt. [1934], pp. 19–24, 26, 27, 31, 33*).—Information obtained in tests with beef cattle and not previously noted is reported on grinding shelled. ear, and snapped corn for yearling steers; the paired feeding method for nutrition experiments; differences between red- and white-faced steers; pasture v. dry-lot feeding; long alfalfa, alfalfa meal, and alfalfa meal and cottonseed cake for fattening yearling steers; the seeding and carrying capacity of temporary pastures; creep feeding beef

calves at the North Platte Substation; and wintering range calves at the Valentine Substation.

With swine, results are reported on studies on cornfield feeding of pigs, and crossbreeding swine at the North Platte Substation.

Sheep studies yielded data on the expected difference in gain of paired individually fed lambs.

Poultry investigation results are reported on comparative efficiency of various proteins in poultry feeding, and the nutritive requirements of growing chicks and growing turkeys.

Creep feeding calves, H. B. Osland and G. E. Morton (*Colorado Sta. Press Bul. 87 (1935), pp. [8], figs. 2*).—A series of three tests was undertaken to compare creep feeding and no-creep feeding, determine the relative cost of this practice, and compare creep-fed and no-creep-fed calves during the finishing period in dry lot. Plans are given for the creep feeder used.

In the first test it was found that late calves started on the creep after the pasture season began did not take readily to grain until the range began to dry up. The added gains on these calves were low and expensive, even though they consumed large amounts of grain during late summer. In the feed lot these calves tended to make larger gains and to sell for a higher price due to the added finish, but this increase was not great enough to offset the cost of creep feeding during the summer.

The second test showed that early calves started on the creep before the pasture turned green began to eat grain almost immediately and continued to consume it through the spring and summer months. With such calves creep feeding produced enough more weight to pay for the grain even when grass was abundant.

In the third test a mixture of corn and barley seemed to be no more palatable than rolled oats. During a dry year with scant pasture creep-fed calves gained 73 percent more than calves having no access to grain.

Studies in lamb feeding, L. H. Blakeslee (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 192–196*).—In order to study the advisability of the maximum use of hay and the substitution of straw or cornstalks for part of the hay, 10 lots of lambs were fed as follows: (1) Alfalfa hay and shelled corn, hand full-fed, (2) alfalfa hay and shelled corn 2:1, hand-fed for the first 56 days, and the shelled corn then increased to 1.5 lb. per head, (3) alfalfa and shelled corn 3:1 with the corn limited to 0.5 lb. for the first 47 days and then full-fed, (4) ground alfalfa and shelled corn 3:1 self-fed for 56 days, equal parts for 14 days, and 1:2 parts for 28 days, (5) the same as lot 2 with oat straw replacing one-half of the hay, (6) ground alfalfa, ground oat straw, and shelled corn equal parts self-fed for 56 days, corn, hay, and straw 2:0.5:0.5 for 14 days, and corn, hay, and straw 4:0.5:0.5 for 28 days, (7) ground alfalfa, shelled corn, ground oat straw, linseed cake 30:30:30:12 self-fed for 56 days, ground alfalfa, ground straw, shelled corn, and linseed cake 50:50:100:27 for 14 days, and ground straw, ground hay, shelled corn, linseed cake 50:50:200:37 for 28 days, (8) the same as lot 2, but with cut corn fodder to replace one-half the hay, (9) the same as lot 2, but with corn silage replacing one-half the hay, and (10) hand-fed grain as in lot 2, but one-half the hay supplied by ground shocked corn with additional grain for the last 42 days.

Satisfactory gains of 0.3 lb. or more per head daily were made in lots 1, 2, 3, 7, and 9, while lots 4, 5, and 6 made gains ranging from 0.27 to 0.3 lb. per day. Lots 8 and 10 made gains of 0.26 and 0.23 lb., which were considered unsatisfactory. In economy of feed per unit of gain the lots ranked as follows: 7, 4, 6, 2, 1, 5, 3, 9, 8, and 10. The least expensive gains were made in lots 5, 6, 7,

and 9, and the most expensive in lots 8 and 10. The carcass grades of the lots fed oat straw or cornstalks unsupplemented with protein graded lower in the coolers than those receiving hay alone or hay and silage.

A complex pig-feeding experiment, F. YATES (*Jour. Agr. Sci. [England], 24 (1934), No. 4, pp. 511–531, fig. 1*).—In this paper from the Rothamsted Experimental Station, the author summarizes the conditions which must be fulfilled in planning animal husbandry experiments if the results are to be statistically valid. Possible methods for improving the efficiency by suitable planning are suggested.

The results of a swine feeding test at the station showed that under the conditions of the experiment green feed was essential to young pigs, that pigs fed on wet mash grew at a faster rate than pigs fed on dry meal, the difference being due to the greater quantity of feed consumed, and that the effects of numbers in a pen were negligible in spite of the greater possibilities for exercise in the larger pens.

The various standard errors of the test were evaluated and compared with Dunlop's results (E. S. R., 72, p. 670). It is pointed out that the lower errors at Cambridge attributed to the method of rationed feeding may be due to other causes. Possible modifications of experimental set-up are discussed.

The abdominal fat of the western range horse, H. A. SCHUETTE, T. M. GARVIN, and E. J. SCHWOEGLER (*Jour. Biol. Chem., 107 (1934), No. 3, pp. 635–639*).—The fats used in this study at the Wisconsin Experiment Station were removed from the abdominal cavities of western range horses not over 4 yr. old. These horses had never been broken to harness or saddle and had been left to their own devices in the matter of foraging for food. The fat was rendered at water bath temperature in an atmosphere of carbon dioxide, clarified by filtration, and dried by distillation at reduced pressure in the same gas. The final product was lemon-yellow in color, of semisolid consistency, and its acidity expressed as oleic acid was 1.97 percent.

The glycerides of the fat contained 26.3 percent of palmitic acid, 4.5 of stearic acid, 46.9 of oleic acid, 11.9 of linoleic acid, and 4.5 percent of linolenic acid. There was no evidence to show the presence of heptadecylic acid. It was not possible to correlate the effect of environment, mode of existence, or nature of subsistance with the character of the fat.

Feeding experiments with farm work mules, R. KUYKENDALL (*Mississippi Sta. Bul. 305 (1935), pp. 23, figs. 12*).—Continuing this series of tests (E. S. R., 66, p. 766) at the Delta Substation, it was found that threshed sagrain was equal to shelled corn pound for pound for feeding mules. Chopping saved about 18 percent of sagrain stover, but only 4.5 percent of soybean hay when used as a roughage for mules. For mules doing medium work a ration of green sagrain stalks and heads should be supplemented with other grain to keep them in good condition.

Self-feeding kept mules in good condition for maximum efficiency at an additional cost of only a few cents per day. Mules ate about 3 lb. of cottonseed meal or cake daily per 1,000 lb. of live weight when limited to a half-grain ration, but ate only 1 lb. when the ration was not limited. Adding blackstrap molasses to cottonseed cake increased its palatability, and the further addition of 0.5 oz. of salt per 1,000 lb. of live weight still further increased palatability. Self-feeding cottonseed cake or meal and hand-feeding a limited grain ration proved to be a good practice. In feeding value 1 lb. of cottonseed cake or meal was equal to approximately 2 lb. of shelled corn. The mules consumed only one-half as much cottonseed hulls as alfalfa hay. Under ordinary conditions

it was economical to use cottonseed cake or meal as half the grain ration for farm work mules.

Appended is information concerning cotton as a food and feed crop, suggestions for its use as a mule feed, and general suggestions for the management of mules.

[Poultry investigations in Rhode Island] (*Rhode Island Sta. Rpt.* [*1934*], *pp. 77–79, 83, 84*).—Data are reported on the effect of certain calcium intake levels on hatchability and eggshell formation, and on the relation between state of egg production October 1 and yearly averages, by H. O. Stuart.

Hens v. pullets, J. M. Moore, E. H. Pfahler, and C. G. Card (*Michigan Sta. Quart. Bul.*, *17* (*1935*), *No. 4*, *pp. 197–202*).—Mortality was found to be about the same in a lot of pullets and in a lot of hens in similar tests conducted for 2 yr. More birds were culled from the pullet lot, which tended to reduce the mortality for this group since several were culled because of low vitality.

The production per bird was practically the same in both lots. Hens laid 76.5 percent large, 15.2 medium, 8.3 checks and dirties, and 0 percent of pullet eggs as compared with 44.9, 39.1, 7.2, and 8.8 percent, respectively, for the same grade of eggs for the pullets. Pullet production was higher in the fall and lower in the winter than hen production. Both groups reached their peaks of production during the spring months, but gradually declined in the late summer. The feed cost per bird and per dozen eggs was practically the same in both groups.

These results show that when it is not possible to raise enough pullets for the replacement of the entire flock, good production can be obtained from flocks of selected mature hens.

Housing, labor-saving equipment, and management procedures for layers, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 174* (*1935*), *pp. 108–112*, *figs. 2*).—In this article the authors discuss the housing, ventilation, window space, labor-saving equipment, and advantages of different shapes of rooms for laying birds.

The nitrogen balance of laying hens, J. S. Willcox (*Jour. Agr. Sci.* [*England*], *24* (*1934*), *No. 4*, *pp. 636–648*, *figs. 2*).—An investigation was undertaken at the University of Leeds to study the variations that occur in the daily retention of nitrogen by laying birds and to estimate the nitrogen requirements for egg production. The balance experiments were conducted with two Rhode Island Red hens over periods of 10 weeks' duration.

Variations in the retention of nitrogen for egg production did not appear to be connected with the output of egg nitrogen or with the number of eggs laid in the various egg cycles. It was evident that the nitrogen required for egg production could be largely if not entirely taken from the ingested food. The marked storage of nitrogen which occurred prior to the beginning of egg laying was not repeated during the laying period. The results indicated that during a period of heavy egg production the synthesis of nitrogenous constituents of the eggs proceeded at a fairly uniform rate.

It was estimated that digestible nitrogen for maintenance and for production purposes could be provided by a less liberal feeding of digestible protein than current standards indicate.

Phosphorus partition in the blood serum of laying hens, R. R. Roepke and J. S. Hughes (*Jour. Biol. Chem.*, *108* (*1935*), *No. 1*, *pp. 79–83*).—In this investigation at the Kansas Experiment Station it was found that the total and lipoid phosphorus of the serum of laying hens was about three times that of males and nonlaying hens. The inorganic and acid-soluble fractions differed only slightly in the three groups of birds. The percentage of ultra-

filtrable inorganic phosphorus in the serum of laying hens was about one-half that for males and nonlaying hens. In the latter two groups the total phosphorus of the serum was equal to the sum of the lipoid and acid-soluble fractions, while in laying hens the total phosphorus of the serum was greater than the sum of these fractions, indicating the presence of a phosphoprotein. This fraction of the serum of the laying hen had properties similar to those of vitellin. Serological tests gave some indications that the vitellin of egg yolk was similar to a protein in the serum of laying hens.

Effects of mineral supplements on the length of the tail and wing feathers in White Leghorns, W. A. Hendricks (*Poultry Sci., 14 (1935), No. 4, pp. 221–227, fig. 1*).—Continuing this series of statistical papers (E. S. R., 73, p. 527), an analysis is reported of feather measurements obtained during an experiment designed to determine the effect of certain mineral supplements, particularly inorganic sulfur compounds, on the molt of White Leghorn hens.

The results showed that the variability in lengths of selected tail and wing feathers due to differences in mineral supplements fed was not significantly larger than the variability between feathers of the same type in the same lot of birds. The variability due to differences in mineral supplements appeared to be significantly greater than the variability due to actual errors of measurement made in measuring feathers, but the comparison was of little practical importance.

A method for determining the ash content of the leg bones of chicks with slipped tendon, T. T. Milby (*Poultry Sci., 14 (1935), No. 4, pp. 247–251*).—At the Iowa Experiment Station 10 lots of chicks fed 6 different rations were used as a source of material for making a more complete and detailed examination of the methods of collecting data and analyzing the ash content of the leg bones of chicks.

The results showed no significant difference in the ash content of femurs, tibias, or metatarsi of chicks on various rations which were afflicted with slipped tendon and the ash content of the corresponding bones of chicks on a control ration at the same age. The ash content of the femurs of chicks receiving a ration containing 3 percent of magnesium carbonate was significantly lower than that of the femurs of chicks on a control ration, but not as low as is usually found in rachitic chicks.

It appeared desirable to make determinations at intervals during the course of an experiment in which calcification may be disturbed. This procedure makes it possible to detect as small a difference with replications as with an equal number of individuals on a single test.

The fate of the antirachitic factor in the chicken.—III, The effective levels and the distribution of the factor from cod liver oil and from irradiated ergosterol in certain tissues of the chicken, W. C. Russell, M. W. Taylor, and D. E. Wilcox (*Jour. Biol. Chem., 107 (1934), No. 3, pp. 735–746*).—Continuing this study (E. S. R., 69, p. 703), normal bone ash and body weight were obtained in chicks fed 0.25 percent of cod-liver oil, 5.5 Steenbock units per 100 g of ration, up to 8 weeks of age. To obtain these same results with irradiated ergosterol 192 times or possibly 144 times this number of units of the factor were required. The livers of 8-week-old normal chicks that had received cod-liver oil contained less than 5 units of the antirachitic factor per liver, while chicks that had received irradiated ergosterol in amounts just insufficient to cause normal bone formation had at least 5 units per liver. The antirachitic factor of either of these sources was not lost by excretion in the bile.

The blood and long bones of 21-week-old cockerels that had received the antirachitic factor in the form of 1 percent of cod-liver oil contained essentially the same concentration of the factor as was found in the case of cockerels which had received irradiated ergosterol equivalent to 24 percent of cod-liver oil. The solid elements of the blood of both groups was practically devoid of the factor, and none was detected in the spleens. The livers of the cod-liver oil group contained less than 5 units of the factor, while those of the irradiated ergosterol group contained at least that number.

Groups of birds fed cod-liver oil and irradiated ergosterol produced eggs at the same rate for a short period, but production was not maintained in the latter group. The antirachitic potency of the yolks in the cod-liver oil group was considerably less than that in the irradiated ergosterol group. Both cockerels and pullets receiving 1 percent of cod-liver oil and irradiated ergosterol equivalent to 24 and 96 percent of cod-liver oil were normal in body weight, feathering, and appearance.

The time factor in egg formation, D. C. WARREN and H. M. SCOTT (*Poultry Sci., 14 (1935), No. 4, pp. 195–207, figs. 2*).—White Leghorn females in their first or second year of production were used at the Kansas Experiment Station to make a comprehensive study of the time element in egg formation in the domestic hen. The birds were killed or anesthetized at varying intervals following the production of the first egg of the clutch.

Ovulation was observed in 12 anesthetized birds, and in only two cases was the ovum released directly into the infundibulum. In the other cases the ovum was dropped into the cavity about the ovary and later picked up by the infundibulum. The mean lapse of time between expulsion of the previous egg and ovulation was 30.7 min., with a range of from 14 to 75 min. However, it was felt that ovulation was regulated by the sequence of maturation of the ova and not by the expulsion of the previous egg. The grasping of the follicle by the infundibulum was random and not a causative factor in ovulation. The time spent by the egg in the various parts of the oviduct was as follows: Infundibulum 18 min., magnum 174 min., isthmus 74 min., uterus and vagina 20 hr. 40 min., a total of 25 hr. 6 min. No relationship was found between the rate of passage through the first three parts of the oviduct and the rate of egg production. The period between expulsion of the previous egg and ovulation appeared to have no relation to rate of laying. The variations in time spent in the uterus were probably responsible for most of the differences in interval length in birds.

Certain so-called malpositions a natural occurrence in the normal development of the chick embryo, N. F. WATERS (*Poultry Sci., 14 (1935), No. 4, pp. 208–216, figs. 9*).—This paper from the Iowa Experiment Station reports the changes and frequencies in position of the live chick embryo occurring after the eighteenth day of incubation.

It was found that embryonic changes in position take place within the egg after the eighteenth day, and that certain of the previously described malpositions are but a normal occurrence in the normal development of the embryo. Practically all the embryos examined were in some one of the so-called malpositions about the eighteenth day, and if embryonic death occurred at this time the embryo would not be in a normal hatching position. Many of the malpositions may have been the result of embryonic death rather than the cause.

The position head between thighs was approximately normal for nearly all 18-day-old embryos. The cause and origin of the position head rotated away from air chamber was not determined, but was probably due to the fact that

these two factors were not properly adjusted. The frequency of the position feet over head was not large and always accompanied one of the other positions.

A lot of eggs placed in a horizontal position on the seventeenth day of incubation and turned four times daily to hatching was compared with a similar lot allowed to hatch without turning. In both cases the eggs pipped with about the same frequency on top, bottom, and sides. The deciding factor as to where an embryo in normal hatching position would pip was determined by the position of the air chamber in the egg. Embryos usually pipped near the lower end of the air chamber, and this position of air chamber and embryo often did not exist until after the nineteenth day.

Gonad-stimulating potency of individual pituitaries, R. G. JAAP (*Poultry Sci., 14 (1935), No. 4, pp. 237–246*).—These researches at the Wisconsin Experiment Station were planned to obtain a method by which the bases of individual differences in gonadal function might be evaluated.

It was found that the combined injection of two duck pituitaries with certain blood sera from ducks brought about the opening of the vagina in sexually immature rats. Neither of these factors when injected alone produced any detectable response. Pituitaries and pituitary extracts injected in small amounts for 4 to 6 days caused an increase in the weight of the testes and ovaries of 11-day-old chicks. When the injections were given at equal levels, the weight increase of the testes was greater than that of the ovaries. In chicks the combined injection of blood sera had no measurable effect on the gonad stimulation derived from pituitaries or pituitary extracts.

Because of the small amount of variability and the ease with which the testes of baby ducklings responded to pituitary stimulation, they were found to be excellent for testing the gonad-stimulating power of individual bird pituitaries. Blood sera from laying ducks and from drakes during the winter months when injected into ducklings increased the action of the pituitary on the testes. A composite sample of serum from drakes during the time they were producing femalelike feathers of summer plumage failed to increase the action of injected pituitaries and extracts in both male ducklings and female rats.

For testing thyroid stimulation newly hatched chicks were superior to newly hatched ducklings.

Sex ratio and embryonic mortality in the domestic fowl, T. C. BYERLY and M. A. JULL (*Poultry Sci., 14 (1935), No. 4, pp. 217–220*).—The sex of 17,989 dead embryos which lived to the ninth day of incubation or longer was determined by dissection by the U. S. D. A. Bureau of Animal Industry. Of these, 47.56±0.25 percent were males. Among the total were 253 chondrodystrophic embryos, of which 54.2±2.11 percent were males.

Among the 2,414 progenies from several breeds and crosses 28,015 individuals were sexed at 10 weeks of age, and 50.1±0.23 percent were males. With the Rhode Island Red progenies a significant negative correlation was found between the percentage hatch of fertile eggs set and the percentage of males at 10 weeks of age. Among White Leghorns the correlation between these factors was not significant. Sex-linked genes deleterious to hatchability were probably present in the Rhode Island Reds. There was no indication of differential postnatal mortality between sexes.

A method of obtaining spermatozoa from the domestic fowl, W. H. BURROWS and J. P. QUINN (*Poultry Sci., 14 (1935), No. 4, pp. 251, 253, 254*).—In this paper from the U. S. D. A. Bureau of Animal Industry the authors describe a method for obtaining supplies of undiluted spermatozoa from the domestic fowl

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Massachusetts] (*Massachusetts Sta. Bul. 315 (1935), pp. 18, 19, 23, 36–38*).—Data obtained in studies with dairy cattle are reported on the proper supplementary ration for milking cows on pasture, by J. G. Archibald, V. A. Rice, R. C. Foley, and C. H. Parsons; the comparative efficiency of dairy cattle in converting feed into milk, by Rice and W. T. Smith; and a study of bull indexes and the formulation of the intermediate bull index, by Rice.

With dairy products information was obtained in a comparison of several mediums for determining the bacterial content of milk by the plate count method, by R. L. France and B. E. Supowitz; a study of ice cream high in fat content, by M. J. Mack; the utilization of frozen fruits in ice cream, by Mack and C. R. Fellers; a study of the changes that occur in the storage of frozen sweet cream, by H. G. Lindquist; a study of the comparative efficiency of electrically operated tanks v. ice in the cooling of milk, by J. H. Frandsen; and a study of the possibilities of milk, cream, and plastic cream in the development of new products such as combinations with honey, fruits, and flavors of various kinds, by Frandsen and T. Marcus.

[Dairy husbandry and dairying studies] (*Farm Res. [New York State Sta.], 1 (1935), No. 4, pp. 1, 4, 5, 6, 7, figs. 4*).—Articles are included entitled Station Dairy Herd Bred for Production, by A. C. Dahlberg (pp. 1, 7), "Dairy Day" at Geneva (p. 4), and Farming along the Mediterranean Sea—IV, Dairy Husbandry in the Near East, by R. S. Breed (pp. 5, 6) (E. S. R., 73, p. 233).

Manamar for growth and milk production, C. F. Monroe, W. E. Krauss, and C. C. Hayden (*Ohio Sta. Bimo. Bul. 174 (1935), pp. 128–133*).—In this test a group of heifers was fed from an average age of 8.5 mo. up to the time they dropped their second calves on a grain mixture containing Manamar, and the results were compared with a similar group in which linseed meal replaced the Manamar. Both rations had the same protein content and aside from the source of protein the feeding and management of the groups were identical.

Under the conditions of this test Manamar and linseed meal were found to be practically equal in their effect on growth and milk production There was no appreciable difference in the effect of the two feeds on the health of the animals.

Blindness in cattle associated with a constriction of the optic nerve and probably of nutritional origin, L. A. Moore, C. F. Huffman, and C. W. Duncan (*Jour. Nutr., 9 (1935), No. 5, pp. 533–551, figs. 6*).—This paper from the Michigan Experiment Station describes 24 cases of a nutritional type of blindness which was apparently different from the true vitamin A type of blindness. The condition was observed in calves following birth and in young growing dairy animals when a ration containing poor quality hay had been fed.

The condition was characterized by a dilated pupil and by the absence of inflammation of the external structures of the eye. It was frequently associated with paralysis, weakness, spasms, and poor reproductions denoted by premature births and retained placentas. The blindness was due to an atrophy of the optic nerve where it passes through the optic foramen, apparently because of bone pressure.

A deficiency of vitamin A may or may not cause this blindness, and the evidence indicated that vitamin D was not a major factor. The evidence further indicated that the blindness was not directly due to a calcium deficiency. Corn silage, timothy hay, and cod-liver oil contained the factor or factors necessary to prevent this type of blindness.

Value of legume hay for lactation and growth in dairy heifers, C. O. JACOBSON (*Arkansas Sta. Bul. 318 (1935), pp. 20*).—This investigation was undertaken to determine the relative value of alfalfa and prairie hay for milk production, for growth in young dairy heifers, and for reproduction, when fed with a grain ration of white corn and rice meal supplemented with minerals and linseed meal.

When prairie hay was fed as the sole source of roughage with a grain ration of rice meal, white corn chop, and linseed meal with added steamed bone meal it was not adequate for normal production or reproduction. This ration appeared to lack in vitamin A. With the same grain ration alfalfa hay was adequate for production. The above alfalfa ration without protein or mineral supplement produced moderate and steady growth, but the animals did not reach the peak attained by animals fed a similar ration supplemented with protein and minerals and with prairie hay replacing the alfalfa hay. The prairie hay ration apparently furnished vitamin A at about the minimum requirements for normal growth, but since normal production and reproduction were limited by this ration there was apparently little storage of the vitamin during the growth period. Breeding difficulties, number of services per conception, abortions, and premature calvings were increased by rations low in vitamin A. Alfalfa hay was far superior to prairie hay for supplying vitamin A.

These results have practical significance in Arkansas where much white corn and rice byproducts are fed with prairie hay.

Dry concentrates as a partial substitute for whole milk in calf rations, E. S. SAVAGE and C. H. CRAWFORD (*[New York] Cornell Sta. Bul. 622 (1935), pp. 29, figs. 5*).—In this study a total of 76 young dairy calves was used in 20 different feeding trials in an effort to develop a calf-starter concentrate mixture which would produce as good as or better growth and development than other approved methods of feeding. The calves were started on a whole milk feeding schedule, which was gradually reduced and finally omitted at the end of the seventh week. Calf-starter mixtures containing various amounts of dried skim milk, various supplements to dried skim milk, minerals, cod-liver oil, and a calf starter composed of coarse ingredients were fed.

The results showed that a calf-starter mixture need not contain more than 22 percent of dried skim milk. On the basis of gains produced, cereals and their byproducts and linseed meal effectively supplemented dried skim milk. Supplements to prevent back weakness or other defects may be necessary under certain conditions. Calves fed a limited amount of milk and a calf starter containing blood flour made more variable but less rapid growth while young than calves fed more milk and the calf starter containing 22 percent of dried skim milk. Calves that were stabled continuously until after they were 6 mo. old required more protection against back weakness than was furnished by the 22 percent of dried skim milk mixture and hay.

When fed according to the schedules followed in these trials the dried skim milk mixture may be expected to produce satisfactory gains. The composition of the recommended calf-starter formula is given.

Magnesium studies in calves.—I, Tetany produced by a ration of milk or milk with various supplements, C. W. DUNCAN, C. F. HUFFMAN, and C. S. ROBINSON (*Jour. Biol. Chem., 108 (1935), No. 1, pp. 35–44; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 237, 238*).—In investigations at the Michigan Experiment Station, tetany occurred in 20 calves which had normal blood calcium and inorganic phosphorus and which had been fed whole milk or milk with several different supplements. Systematic blood magnesium determinations were not made on these animals. Data are presented on five typical

calves which died in tetany, with normal blood calcium and inorganic phosphorus but with low blood magnesium.

Tetany associated with low blood magnesium was indistinguishable from that associated with low blood calcium unless blood studies were made. Magnesium tetany occurred on rations either high or low in fat. The blood calcium to magnesium ratio in calves manifesting low magnesium tetany was 8:1 to 10:1. It was felt that these results served to partially explain previous failures to raise calves to maturity on whole milk rations.

Evaluating the efficiency of dairy cattle, S. Brody and A. C. Ragsdale (*Missouri Sta. Bul. 351 (1935), pp. 10, fig. 1*).—A simple method for determining the efficiency of individual cows as milk producers is presented, with the necessary charts and tables.

When the live weights of the cows and the fat percentages in the milk produced are the same, cows producing the larger flow of milk make the greater returns for their feed. However, if the fat content of the milk varies it is necessary to equalize the energy content by converting to a standard 4 percent milk before estimating the influence of body weight on efficiency of milk production.

Small cows tend to be slightly more efficient in food utilization than large cows. In order to produce a given amount of milk, however, more small cows are needed than large cows. This increases the investment and the overhead costs. Large udder capacity and stimuli to high milk production are more important than live weight for economical production.

[Investigations with dairy products in Nebraska] (*Nebraska Sta. Rpt. [1934], pp. 7, 8*).—Studies with dairy products yielded data on the comparative vitamin A content of sweet cream and sour cream butter and of oleomargarine, and milk quality as affected by the individual cow in the herd.

The acidity of milk and dairy products, H. H. Sommer (*Wisconsin Sta. Res. Bul. 127 (1935), pp. 24, fig. 1*).—The author points out that there are two fundamentally different methods of expressing acidity: (1) Titratable acidity, which measures the total acidity, and (2) pH concentration, which indicates the strength of the acid solution. The application and limitations of the two methods are discussed.

Fresh milk from individual cows varies in acidity from 0.1 to 0.26 percent. Herd milk varies less, but occasionally herds are found where the range is from 0.18 to 0.23 percent. This acidity is due to phosphates, casein and albumin, and citrates and carbon dioxide. While the acidity of milk may change during lactation there are no definite trends, except that colostrum is high in acidity and at the very close of lactation acidity is frequently low. Feeds and even ingested acids do not increase the acidity of milk. Mastitis even in mild or subclinical form causes the acidity of milk to be lower, but in rare cases may increase the acidity of milk. Bacteria in milk produced mainly lactic and acetic acids, but the bacteria must increase several millions per cubic centimeter before there is a measurable increase in acidity.

For grading milk the acidity test must be used with discretion, since fresh milk varies widely in acidity and because of the great numbers of bacteria required to produce the initial rise in acidity. Calculating the expected acidity of cream from the acidity of the milk and the fat content of the cream is not accurate unless the acidity of the cream is determined by measuring 9 cc of cream, adding 9 cc of water, and then titrating. In using the acidity of condensed milk as a measure of the quality of the raw materials, the measured sample should be diluted with enough distilled water to bring the sample to the original concentration of the milk. The acidity of ice cream mixes is higher

than the acidity of milk in the same proportion that the serum solids content of the mix is higher than that of milk.

Keeping cream cool in the cream station, E. L. Fouts (*Natl. Butter and Cheese Jour., 26 (1935), No. 14, pp. 14, 15, figs. 2*).—In this article from the Oklahoma Experiment Station a device for keeping cream cool is described. The method depends upon evaporating water for reducing the temperature. A fine mist is sprayed over the cans from a specially constructed nozzle. The apparatus is economical and easy to construct and operate, it is convenient and requires no floor space except that occupied by the cans, it distributes water over a large area without waste, it cools the surrounding air, and it holds the cream temperature at a lower point than is possible without evaporation.

Soft curd milk studies, M. H. Berry (*Milk Plant Mo., 23 (1934), Nos. 10, pp. 30–33, 37, fig. 1; 11, pp. 50, 53–56*).—The purpose of this investigation at the Maryland Experiment Station was to obtain more information regarding certain phases of the production, handling, or processing of soft-curd milk.

Holding milk for several days at 40° F. did not affect the curd hardness if the acidity did not increase to any appreciable extent. There was no great variation in the curd character of milk between milkings of the same day or consecutive days over a short period of time. Colostrum formed a very hard curd upon coagulation. Freezing milk had a hardening effect upon curd. Viscolizing at 3,000 to 5,000 lb. pressure was required to change hard-curd milk to soft-curd milk. The greater the original curd tension, the greater was the percentage reduction in curd tension following viscolization. The ordinary pasteurizing temperature had no effect on curd tension, nor did heating at 160° for 30 min. change hard curd to soft curd. A temperature of 180°, however, had a marked softening effect. Curd tension was usually fairly uniform throughout the lactation period except for a few days immediately after freshening, when it may be very hard.

In tests with rats, natural soft-curd milk did not produce greater gains nor was it consumed more readily than normal hard-curd milk or such milk rendered soft by heat or pressure.

What is bottled concentrated milk? R. B. Stoltz (*Milk Plant Mo., 24 (1935), No. 3, pp. 52–54, 56, 58*).—In this article the author describes the nature and production of concentrated milk. For this product some of the water was removed from whole milk with the idea that it would lower the cost of transportation sufficiently to more than save the cost of the concentration process. Good quality standardized milk was pasteurized, homogenized, and cooled to 45° F. It was then forewarmed in a chromium nickel hot well to 143°, and drawn into a rubber-lined 16-in. vacuum pan that had a vacuum of 25 in. It required about 2 hr. to condense 12 gal. of milk. The condensed product was filtered, cooled to 50°, bottled, and then handled as ordinary milk.

A typical group of consumers was willing to accept the concentrated product, but preferred to use it on cereals and in coffee rather than to dilute and use as a fluid milk. No appreciable difference was detectable between the original milk and the diluted product. The keeping qualities of the concentrate were slightly better than those of the original pasteurized milk. The bacterial counts of the freshly concentrated milk showed no marked increase, and there was a slower bacterial development. Some feed flavors were expelled in the vacuum pan, and at times some of the desirable flavors were lost. A cream layer did not form until after the fourth day, but it was necessary to homogenize to prevent fat separation on long standing. A small amount of sediment could be noticed if a clarifier was not used after homogenization. The physical

and chemical properties were only slightly altered by condensing and diluting back to normal milk consistency with water. The cost of processing varied from 0.42 to 2.67 ct. per quart, depending upon the plant.

Condensed milk and milk powder, O. F. Hunziker (*La Grange, Ill.: Author, 1935, 5. ed., rewritten and enl., pp. [16]+661, figs. 148*).—This is an enlarged and revised edition of the book previously noted (E. S. R., 56, p. 75).

The commercial manufacture of yoghourt milk, E. Brochu (*Milk Plant Mo., 24 (1935), No. 5, pp. 37–41*).—In this paper from the Oka Agricultural Institute, Quebec, the author describes the operations and equipment needed for the manufacture of yoghurt milk. The commercial aspects and the methods of consumption of this product are discussed.

Packaging, curing, and merchandising American Cheddar cheese in cans, H. L. Wilson (*U. S. Dept. Agr. Circ. 352 (1935), pp. 15, figs. 7*).—This circular describes the equipment and supplies needed, the hooping and pressing of the curd, the cutting, weighing, wrapping, and sealing of the cheese in the cans, and the curing, labor, and cost of packaging the cheese. It is pointed out that good quality in a cheese is as important in this method of marketing as in any other method of marketing cheese.

The theory and practice of ice cream making, H. H. Sommer (*Madison, Wis.: Author, 1935, 2. ed., pp. [5]+IX+639, pls. 4, figs. 61*).—This is a revised and enlarged edition of the book previously noted (E. S. R., 69, p. 707).

Using frozen sliced strawberries in manufacturing ice cream, M. J. Mack and C. R. Fellers (*Ice Cream Trade Jour., 30 (1934), No. 12, pp. 27, 28*).—In tests at the Massachusetts Experiment Station it was found that strawberries sliced before packing had a somewhat better flavor in the frozen pack than whole berries. The color of the sirup of such a pack was better and the amount of sirup appeared to be less, although it actually was slightly increased. Undissolved sugar was also likely to be present in only very small amounts. While these factors were important in the use of berries in the manufacture of ice cream, such factors as variety of fruit, size and quality of berries, degree of ripeness, and fruit to sugar ratio had a greater effect on the flavor of ice cream than did the slicing of berries before packing.

VETERINARY MEDICINE

Clinical diagnosis by laboratory methods: A working manual of clinical pathology, J. C. Todd and A. H. Sanford (*Philadelphia and London: W. B. Saunders Co., 1934, 7. ed., rev., pp. 765, pls. 12, figs. 303*).—A revised edition of a work on diagnosis of disease by laboratory methods, presented in 11 chapters, in which particular attention is given to the blood (pp. 218–398). Chapters are devoted to animal parasites (pp. 454–531), serodiagnostic methods (pp. 583–651), bacteriologic methods (pp. 652–688), vaccines (biological skin tests) (pp. 689–702), etc.

[Report of work in animal pathology by the Massachusetts Station] (*Massachusetts Sta. Bul. 315 (1935), pp. 75–79*).—Animal disease control work reported upon (E. S. R., 71, p. 526) includes that with pullorum disease investigations and eradication and miscellaneous laboratory diagnoses, by H. Van Roekel and his associates; experiments on the vaccination of baby chicks against infectious laryngotracheitis, serological experiments with the virus, and its occurrence in eggs, all by C. S. Gibbs; comparative studies of Toisson's fluid and Hayem's fluid containing 2 percent eosin for counting erythrocytes and leucocytes in avian blood, by Gibbs and his associates; the oxydase test in avian pathology, by Gibbs and K. W. Chapman; leucosis and avian paralysis, by Gibbs and C. G.

Johnson; and proventriculitis and ventriculitis and infectious coryza, both by Gibbs and K. L. Bullis.

[Contributions on animal pathology] (*Arch. Wiss. u. Prakt. Tierheilk., 67 (1933), Nos. 1, pp. 1–101, figs. 22; 2, pp. 103–186, figs. 17; 67 (1934), Nos. 3, pp. 191–289, figs. 22; 4, pp. 291–361, figs. 14; 5, pp. 363–456, figs. 21; 6, pp. 459–539, figs. 11*).—The contributions presented (E. S. R., 73, p. 237) include the following: The Tissue Reaction of the Guinea Pig to *Brucella abortus* Infection and Its Diagnostic Significance, by K. Nieberle and G. Pallaske (pp. 1–9); Experiments and Observations on Dairy Cows in the Course of Streptococcic Mastitis Investigations—V, Comparative Tests of Chemotherapeutic Preparations, Particularly the Acridine Derivatives for Treatment of Mastitis, by M. Seelemann and K. Siemonsen (pp. 10–43) (E. S. R., 73, p. 100); The Corrosive Action of Oxychinol and Entozon on Metals, by M. Miethke and G. Witt (pp. 44, 45); Five Years' Experience with the Injection of the "Pernocton" Hypnotic in Domestic Animals (Dog, Cat, Sheep, Goat, Pig, and Fowl), by J. Schmitt (pp. 46–78); Employment of the Induction Current (Faradization) in Constipation of the Horse, by A. I. Wischnjakow and I. A. Botcharow (pp. 79–83); A Case of Regeneration of Testis Tissue in the Place of Removed Ovary of a Guinea Hen, by J. Křiženecký (pp. 84–90); Nonspecific Tuberculin Reactions in Fowls, by K. Iwanoff (pp. 91–101); Osteodystrophia Fibrosa in the Dog, by G. Pallaske (pp. 103–113); Histological Investigations of *Brucella abortus* Infected Guinea Pigs, with Particular Reference to Its Diagnostic Value in the Detection of *B. abortus* Infected Milk, by A. Lübke (pp. 114–140); The Lymphoid Tissue of the Pharynx of Domesticated Animals, by G. Zimmermann (pp. 141–153); The Pigeon Tapeworm *Raillietina bonini* (Mégnin 1899) and Its Development, by R. Wetzel (pp. 154–166); The Biothermic Method of Destroying Coccidian Oocysts, by W. L. Yakimoff, W. F. Gousseff, M. W. Nezwetaieff, and E. F. Rastegaieff (pp. 167–175); The Tick Vector of Ovine Piroplasmosis in Azerbaidshan (Azerbaijan), Transcaucasia, by E. F. Rastegaieff (pp. 176–186); Gastrotomy in the Bovine, by L. Mauer (pp. 191–223); Investigation of the Cycle of Infection in Enteritis of the Duck, by J. Schaaf (pp. 224–238); The Susceptibility of Young Pigs from Mothers Immune to Hog Cholera, by R. Manninger and I. Csontos (pp. 239–249); The Course and Diagnosis of Bang's Disease, by W. Schmidt (pp. 250–260); Summer Sores in Cattle, by X. Iwanoff (pp. 261–270); Teratoid of the Ovary in Swine, by P. Marajew (pp. 271–276); A Holder for Use in Investigation of and Operation on the Fowl and Other Birds, by O. Seifried, C. B. Cain, and H. Wulf (pp. 277–280); Investigations of the Fowl Pox Virus, by R. Baumann and L. Weissmann (pp. 281–289); The Intestinal Tuberculosis of Swine, from the Pathoanatomical Standpoint, by W. Bolle (pp. 291–321); The Histology of Fowl Pox and Fowl Diphtheria, by E. Fröhlich (pp. 322–334); The treatment of Morbus Maculosus Equorum (Purpura Haemorrhagica) with Calcium and Iodine, by A. Laas (pp. 335–339); Urinary Calculi in the Urethra of the Ram and the Buck, by S. Hoflund (pp. 340–346); The Blood Content of Trakehnen Colts of Varying Ages in Blood Sugar, Residual Nitrogen, and Alkali Reserve, by P. Luy and A. Köser (pp. 347–357); The Arabian Treatment of Camel Disorders in the Middle Ages, by R. Froehner (pp. 358–361); The Capacity of Resistance of Immature Strongylids Outside Their Hosts, by K. Enigk (pp. 363–376); Control of the Liver Fluke and Lungworm Diseases in Districts Bordering on the North Sea, VI (pp. 377–384), VII (pp. 385–390), both by Lührs; The Application of Electrotherapy in Disordered Intestinal Peristalsis of the Horse, by J. Schmidt (pp. 391–395); The Histopathology of Heart Lesions in Goiter, by H. Fassnacht (pp. 396–404); The Variation of the Sugar Content of the Blood and Urine Following Administration of Dextrose, by A.

Szepeshelyi (pp. 405–409); The Diagnostic Value of the Sublimate Test in Infectious Anemia of Horses, by F. Hecke (pp. 410–419); Fluorosis of Sheep in Iceland Following Volcanic Eruptions, by K. Robolm (pp. 420–435); Investigations of a Latently Infected Cow Which Discharged *Brucella abortus* in the Milk, by A. Lübke (pp. 436–452); A Tube Stethoscope with Adjustable Diaphragm for Auscultation of Heart and Lungs of Animals and Man, by H. Steffan (pp. 453–456); Is the Friedmann Remedy a Specific Preventive and Cure for Tuberculosis and Does It Surpass Other Methods? by J. Bongert (pp. 459–488); The Clinical Interpretation of Microscopic Findings in the Vaginal Secretion of the Bitch, by M. Demmel and J. Witzigmann (pp. 489–502); Renal Calculi in the Dog, with Sepcial Reference to Calcareous Infarcts, by G. Pallaske (pp. 503–512); The Relationship of *Actinobacillus lignieresii* Brumpt 1910, of *Bacillus equuli* Van Straaten 1918, and of *B. mallei* Flügge 1886, by H. Haupt (pp. 513–524); A Neoplasm of the Peritoneal Epithelium in the Calf (pp. 525–531) and A Further Note on Basal Cell Cancer of the Dog (pp. 532, 533) (E. S. R., 73, p. 238), both by H. Baumgärtner; and A Leprosylike Disease in the Mouse, by A. Hemmert-Halswick (pp. 534–539).

Animal health investigations, G. A. Julius et al. (*Aust. Council Sci. and Indus. Res. Ann. Rpt., 8 (1934), pp. 23–29*).—Work with diseases and parasites of domestic animals reported (E. S. R., 71, p. 528) includes pleuropneumonia; "peg leg", a phosphorus deficiency disease; tick fever and dipping; foot rot of sheep; tick paralysis in dogs due to *Ixodes holocyclus;* caseous lymphadenitis; enterotoxemia and Gingin disease in Western Australia; etc.

The internal parasites of domestic animals: A manual for veterinary surgeons, T. W. M. Cameron (*London: A. & C. Black, 1934, pp. XII+292, [pls. 17, figs. 103]*).—Part 1 of this work consists of an introduction to parasitology (pp. 1–18); part 2 deals with the Protozoa (pp. 19–48), part 3 with the helminths (pp. 49–217), part 4 with immunity and serology (pp. 218–237), part 5 with the therapeutics of helminthic infections (pp. 238–245), part 6 with technic (pp. 246–267), and part 7 with host lists and a bibliography of 107 titles (pp. 269–284).

Key-catalogue of parasites reported for Carnivora (cats, dogs, bears, etc.), with their possible health importance, C. W. Stiles and C. E. Baker (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 163 (1935), pp. II+913–1223*).—This bulletin represents part 8 of the host catalogs of animal parasites (E. S. R., 68, p. 350).

Decomposition of salts of organic acids by bacteria of the genus Salmonella, A. A. Hajna (*Jour. Bact., 29 (1935), No. 3, pp. 253–258*).—In an investigation of the nutrient requirements of bacteria of the genus *Salmonella* for nitrogen available from inorganic sources to decompose salts of organic acids for a source of carbon and energy, no differences were found among different species. A number of species, including *S. paratyphi*, *S. morganii*, *S. abortivo-equina*, *S. pullorum*, and *S. sanguinarum*, repeatedly failed to grow in any of the salt media, even upon prolonged incubation. The American strains of *S. suipestifer* were found to differ from the European strains by their failure to decompose succinic and fumaric acids. They were both, however, able to decompose lactic and citric acids, and both failed to decompose, to any extent, mucic acid. *S. schottmuelleri*, *S. aertrycke*, and *S. anatis* exhibited considerable regularity in attacking all of the five salts mentioned. *S. enteritidis* was irregular in its attack upon mucic acid. These relations toward mucic acid may be due to the ability or inability of certain strains to attack the compound rather than to the specific adaptability of the species to attack it.

It is pointed out that "all of the strains of *S. schottmuelleri*, *S. aertrycke*, [and] *S. anatis* and some strains of *S. enteritidis* decompose mucic acid, in synthetic liquid media, with the production of acidity, in the first hours of incubation, and, after incubation at 37° C. for 48 hr., the pH of the medium reverts to neutrality. With further incubation, the medium is turned deep prussian blue. On solid medium, these types of organisms decompose mucic acid with the production of alkalinity unlike the reaction observed in the liquid media."

It was found that "all of the strains of *S. schottmuelleri*, *S. aertrycke*, *S. enteritidis*, *S. anatis*, and *S. suipestifer* (European) that decompose fumaric acid also attack succinic acid."

White snakeroot poisoning, R. GRAHAM and V. M. MICHAEL (*Jersey Bul. and Dairy World*, *54* (*1935*), *No. 29*, *pp. 865, 866, 882, 883*).—This is a practical summary of information on the *Eupatorium* poisoning of livestock (cattle, sheep, horses) commonly referred to as "trembles."

Action of thallium in experimental animals, A. J. COX, JR., and E. B. RODGERSON (*Soc. Expt. Biol. and Med. Proc.*, *32* (*1935*), *No. 4*, *pp. 653–655*).—White rats into which thallium acetate was injected subcutaneously over periods up to 9 weeks in length showed "no abnormality of the estrual cycle or of the reproductive organs. The basal metabolic rate of guinea pigs did not change during administration of small or large doses of thallium, except for a rapid decrease shortly preceding death. These findings fail to support previous claims that thallium intoxication is characterized by alteration of endocrine function."

Mottled enamel in cattle, H. T. DEAN (*Pub. Health Rpts.* [*U. S.*], *50* (*1935*), *No. 7*, *pp. 206–210*, *pl. 1*).—An additional area, west Texas, showing mottled enamel in cattle is reported. It is pointed out that a widespread fluorosis in stock may be of some importance in animal husbandry. A list is given of 13 references to the literature.

A serum reaction observed in anaplasmosis.—Preliminary report, W. H. BOYNTON and G. M. WOODS (*Jour. Amer. Vet. Med. Assoc.*, *87* (*1935*), *No. 1*, *pp. 59–63*).—In applying the mercuric chloride precipitation test to anaplasmosis, the technic employed with swamp fever by Fulton (E. S. R., 64, p. 74) was followed. In sera from cattle having no history of *Anaplasma* infection, both the tubes containing the mercuric chloride dilutions and the control tube containing the distilled water remained clear; in sera from known cases of anaplasmosis, just as distinctly positive reactions were obtained in the tubes containing the water controls as in those containing the mercuric chloride dilutions. The technic for obtaining the serum is said to have been, with some slight modifications, the same as that described by Bennett (E. S. R., 62, p. 77) and later by Fulton, the details of which are presented in three tables. The evidence tends to indicate that in comparison with the other diseases considered, except Texas fever, the reaction is peculiar to *Anaplasma* infection. At present, the only value claimed for the serum-water test is that it seems to substantiate the clinical and microscopical findings in the more chronic cases of anaplasmosis, and to be of some diagnostic importance in newly recovered carriers, whose blood appears to be free from *Anaplasma*.

Efficacy of anthrax biologics in producing immunity in previously unexposed animals, W. S. GOCHENOUR, H. W. SCHOENING, C. D. STEIN, and W. M. MOHLER (*U. S. Dept. Agr., Tech. Bul. 468* (*1935*), *pp. 16*, *figs. 4*).—A report is made upon comparative evaluations of six commercial anthrax biologics or combinations of them from the viewpoints of safety, possibility of sensitization, rapidity of immunity production, and the degree and duration of the immunity produced. The work was conducted under conditions in which the test animals

(cattle, horses, and sheep) had had no previous exposure to or contact with anthrax infection. Early potency tests with anthrax biologics conducted by the senior author, made separately rather than on a comparative basis, beginning in 1925, first reported, are followed by a series of experiments carried on in 1933 and 1934.

Information was sought through a comparison of the immunities produced by these biologics at 4, 16, 108, 155, 300, and 360 days after vaccination. The test animals exposed 4, 16, and 108 days after vaccination were injected with the same anthrax culture at the same time. The animals exposed 155, 300, and 360 days after vaccination received an equal injection through the use of a culture prepared from the same culture of *Bacillus anthracis* and in the same manner as the exposure culture used in the first three groups. Preliminary titrations showed these exposure cultures to be equal in infectivity.

In the early tests, which for the greater part were conducted separately, anthrax bacterin (washed culture), anthrax-spore vaccine (intradermic), anthrax-spore vaccine in saponin solution, anthrax-spore vaccine (single injection), and anthrax-spore vaccine (double injection) possessed high immunizing values. Anthrax aggressin exhibited some immunizing value, whereas anthrax bacterin (whole culture) produced comparatively little. A total of 13 tests were made with 88 principal animals and 101 controls.

The products tested in 1933 and 1934 were antianthrax serum, antianthrax serum and anthrax-spore vaccine in combination, anthrax-spore vaccine (single injection), anthrax-spore vaccine (intradermic), anthrax-spore vaccine in saponin solution, and anthrax bacterin (washed culture). The tests were divided into three experiments, 250 sheep being used, 71 in the titration of the exposure cultures, 149 as principals, and 30 as controls.

None of the biologics produced any ill effects in the test animals. None of the products produced any evidence of sensitization to anthrax. Antianthrax serum and anthrax-spore vaccine (intradermic) were the most rapid in producing immunity, complete protection having been established in 4 days after vaccination.

Each of the biologics produced complete protection for some time during the testing period. Antianthrax serum produced the shortest immunity—less than 16 days' duration—whereas anthrax-spore vaccine (single injection) and anthrax-spore vaccine (intradermic) produced the longest immunity, being complete at 300 and 360 days after vaccination. Anthrax-spore vaccine (intradermic) produced the most consistent immunity, there being 100 percent survivals at 4, 16, 108, 300, and 360 days after vaccination and 83 percent at 155 days.

English sparrows as possible carriers of brucellosis, C. F. CLARK (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 224, 225*).—Of 91 English sparrows captured either in and around the hog lots or nearby, within easy flying distance for such birds, and agglutination tested for *Brucella* organisms, 3 reacted slightly in a dilution of 1 to 25. The significance of the slight reaction of these 3 sparrows was difficult to determine, since it may have been due either to sensitization to *Brucella* organisms or to nonspecific agglutinins. It would appear that the sparrows examined were not infected with *Brucella*, if the test may be used as a guide, but it is considered possible that, if in infected surroundings, these birds might carry infectious material on their beaks, feet, or in the alimentary tract, thus spreading the infection.

Problems associated with "coast disease" in South Australia, H. R. MARSTON (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 2, pp. 111–116*).—A brief report of work with the etiology and distribution of this disease initiated in 1929–30.

The diagnosis of Johne's disease by the use of johnin, F. C. MINETT (*Jour. Compar. Path. and Ther., 48 (1935), No. 2, pp. 125–137*).—Thirty-nine of 53 animals that had reacted to the double intradermal test with johnin, many of them on more than one occasion, were conclusively proved to be infected with Johne's disease, and there was presumptive evidence of this infection either from post-mortem examination or from the history of the case in 11 of the remaining 14. Six animals did not react to johnin, but 3 of them were tested once only and 4 of the 6 were at an advanced clinical stage. Repeat tests with johnin on a number of the animals showed much variation in the degree of local response, a result which is attributed to variations in the allergic state.

A contribution to the diagnosis and control of Johne's disease, M. J. J. HOUTHUIS (*Bijdrage tot de diagnostiek en bestrijding der paratuberculose. Proefschr., Rijks-Univ., Utrecht, [1932], pp. [9]+163, [pls. 16], figs. [41]; rev. in Vet. Bul., 4 (1934), No. 1, pp. 10, 11*).—The author reports having found the causative organism of paratuberculosis in the lung, liver, and portal lymph glands. A five-page list of references to the literature is included.

Experiments on the epidemiology of pseudorabies, I, II, R. E. SHOPE (*Jour. Expt. Med., 62 (1935), No. 1, pp. 85–99, 101–117*).—This contribution is presented in two parts.

I. *Mode of transmission of the disease in swine and their possible rôle in its spread to cattle.*—It is pointed out that "pseudorabies is a very fatal but noncontagious disease in cattle and the common laboratory animals. It is a relatively mild yet highly contagious disease in swine. It has been shown that in swine the nose serves both for the entrance and the exit of the virus. Furthermore, it has been observed that fatal pseudorabies infections in rabbits can be induced merely by bringing their abraded skin into contact with the noses of infected swine. The blood sera of swine on two farms where pseudorabies had occurred among the cattle were found to be capable of neutralizing pseudorabies virus. It is believed that in these instances the swine had a mild and unrecognized pseudorabies infection and transmitted their disease to the cattle with which they were associated by transfer of the virus on their noses to the abraded skin of the cattle."

II. *Prevalence of the disease among middle western swine and the possible rôle of rats in herd-to-herd infections.*—"Study of the pseudorabies virus-neutralizing antibody content of pooled and individual samples of swine serum have led to the conclusion that pseudorabies is a highly prevalent, unrecognized disease in middle western hogs.

"It has been shown that wild brown rats develop a fatal infection following ingestion of pseudorabies virus, and that their carcasses, in turn, give rise to the disease in swine to which they are fed. It is believed that rats play a role in the epidemiology of porcine pseudorabies, serving as the initial source of infection for a swine herd and also as one means by which virus can be spread from farm to farm in swine herds. The experiments presented furnish further evidence that swine may serve as the source of infection for cattle."

The developmental forms of psittacosis virus, S. P. BEDSON and J. O. W. BLAND (*Brit. Jour. Expt. Path., 15 (1934), No. 4, pp. 243–247, figs. 4*).—The authors find the apparently homogeneous virus masses observed in the early stages of multiplication of psittacosis virus to be particulate. The significance of the different forms presented by this virus is discussed.

The role of Tabanus orientis Wlk. and Stomoxys calcitrans Linn. in the mechanical transmission of rinderpest, H. L. BHATIA (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 1, pp. 2–22, figs. 4*).—Following a brief review of the literature on rinderpest transmission by arthropoda, experiments are

reported by tables and charts in which rinderpest was mechanically transmitted by *T. orientis*. In work with this tabanid successful transmission resulted only when 30 infected flies were fed, negative results being obtained when a smaller number was used. The transmission work with the stable fly resulted negatively.

A brief report on goat virus inoculations against rinderpest, performed at Balishah, district Dadu, Sind, C. S. G. Haji (*Indian Vet. Jour., 11 (1935), No. 4, pp. 259–262, figs. 4*).—Details of work with goat virus vaccination against rinderpest are reported in tabular form.

The use of goat tissue vaccine for the control of outbreaks of rinderpest in Bengal, P. J. Kerr (*Indian Jour. Vet. Sci. and Anim. Husb., 5 (1935), No. 1, pp. 67–89, figs. 18*).—In control work reported (E. S. R., 71, p. 697), it was conclusively proved that goat tissue vaccine alone is an efficient and safe method to employ to control outbreaks of rinderpest in plains cattle and buffaloes in Bengal.

Studies on surra.—II, Natural recovery from surra infection among oxen and water buffaloes, M. Manresa and B. M. Gonzalez (*Philippine Agr., 23 (1935), No. 10, pp. 859–879*).—In further work (E. S. R., 73, p. 239), the authors have found natural recovery to occur spontaneously among animals belonging to the taurine and bubaline species of cattle. A provisional working hypothesis is offered which may account for the regular upward trend in the number of animals in a given locality or region following the outbreak of surra epizootics. A list is given of 14 references to the literature.

Experiments on surra, M. Manresa and B. M. Gonzalez (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 1, pp. 31–36*).—This report is based upon data in the two reports referred to above.

Ultrafiltration of the virus of vesicular stomatitis, J. H. Bauer and H. R. Cox (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 4, pp. 567–570*).—In the studies conducted, "the filtration end point of the virus of vesicular stomatitis, or the average pore diameter of the finest membrane passing the virus, was found to be approximately 140 mμ. Two immunologically distinct strains of the virus, the 'Indiana' and the 'New Jersey' maintained either in tissue culture or in mouse brain, were studied, and the filtration end point was found to be the same irrespective of the source or serological type of the virus."

The results are said to confirm the findings of Galloway and Elford (E. S. R., 72, p. 691).

Slow and rapid agglutination tests in the diagnosis of Bang's disease, D. R. Coburn (*North Amer. Vet., 16 (1935), No. 2, pp. 33–37*).—According to this report of a study of certain factors affecting the efficiency of these diagnostic tests, "5 commercial rapid antigens were found to give variable results due to the degree of sensitivity and to the time of reaction. Comparison of the methods of standardization of antigens for the rapid and slow tests show that there are fewer sources of error in the standardization of the rapid antigen. Hemolyzed samples can be tested with a greater degree of accuracy and with less special handling by the rapid method than with the tube method of test. The cost of conducting the rapid test is less than that of the tube test."

"Immune" cattle plague antiserum manufactured in the field, J. L. Stewart (*Jour. Compar. Path. and Ther., 48 (1935), No. 2, pp. 117–124*).—It has been found that "field antirinderpest serum manufactured by the process of selecting serum makers by observing visible or severe reactions produces serum of a very varying potency, although quite good results may occur in

areas where the cattle have a certain resistance to cattle plague. In susceptible districts, high casualties invariably occur from time to time.

"It is shown that field serum produced only from cattle which have shown a definite benign thermal response to immunization is, in practice, constant in titer and yields consistently good results without high casualties in certain individual herds. Detailed figures of over 13,000 cattle treated by such serum are shown, and since then 20,000 cattle have been immunized in different parts of the country with even better results. At no time have high casualties appeared in particular herds as was the case with the two previous methods of technic."

Mastitis control program outlined, G. J. HUCKER (*Farm Res.* [*New York State Sta.*], *1* (*1935*), *No. 4, p. 8*).—The importance of disease combat is emphasized and the routine that the dairyman should put into practice for the control of mastitis in his herd outlined.

The value of the lacto-vaccine in protecting the non-infected cows in a mastitis-infected herd, C. S. BRYAN (*Michigan Sta. Quart. Bul.*, *17* (*1935*), *No. 4, pp. 202–208*).—A practical discussion of the value of lacto-vaccination for the protection of noninfected cows in a mastitis-infected herd. The use of this vaccine, which it is said can easily be prepared and administered by a veterinarian, is said to have greatly reduced the spread of infection and in many cases protected all of the noninfected cows from the infection present in the herd. It is best applied in a series of three weekly injections to the noninfected cows to increase their resistance to the streptococci infection present in the herd.

It is concluded that if the eradication program is to extend over a period of years, it is advisable to vaccinate the noninfected animals at least once a year. Heifers that have not been sucked or injured on the udder may safely be bought or raised as replacement animals; however, they should be vaccinated before freshening. It is desirable to eliminate the infected cows as soon as possible to decrease sources of the infective streptococci of mastitis.

A preliminary note on bovine nasal granuloma in Victoria, H. E. ALBISTON and C. J. R. GORRIE (*Aust. Vet. Jour.*, *11* (*1935*), *No. 2, pp. 72–76, figs. 3*).—A disease of bovines characterized by the presence of nodular lesions in the anterior portion of the nasal cavity, reported from several parts of Gippsland and from the western district in Victoria, is described. "The lesions are characterized by an intense infiltration of the submucosa with eosinophiles, and in some cases giant cells enclosing yeastlike bodies are present. A fungus has been isolated, and some of its characteristics are described. The condition is considered to be a blastomycosis, and the authors suggest the name nasal blastomycosis to distinguish the condition from three similar clinical entities due to other causes in India."

Peg-leg of cattle in north Queensland, A. W. TURNER, R. B. KELLEY, and A. T. DANN (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 2, pp. 120–132, figs. 4*).—An account of the so-called "peg-leg disease" of cattle in north Queensland, characterized by underdevelopment, relative infertility, lameness, and various skeletal deformities. "It is most common in pregnant and lactating females during the long dry winter. Evidence is adduced to show that it is essentially an aphosphorosis due to a deficiency of phosphorus in the soil and herbage, aggravated by the absence of rain for long periods.

"In a preliminary experiment at 'Helenslee' during 1933, the dosing of dicalcic phosphate and the administration of disodium phosphate dissolved in the drinking water was followed by very significant increases in body weight, 47.5 percent with the former and 37 percent with the latter.

"A new series of experiments is being carried out to confirm and extend the results of the preliminary experiment, with special reference to the efficacy and practicability of the administration of soluble phosphates in the drinking water and the suitability and palatability of various phosphatic licks."

Contagious bovine pleuro-pneumonia: Note on experimental reproduction and infection by contact, R. Daubney (*Jour. Compar. Path. and Ther., 48 (1935), No. 2, pp. 83–96, figs. 6*).—The author has found it possible for the first time to reproduce by inoculation of the organism, either in lymph or pure culture, the pathological condition regarded as characteristic of contagious bovine pleuropneumonia. "Infections have been obtained once in many attempts by the intratracheal route and five times in nine attempts by embolus production. The evidence in support of the general assumption of a causal relationship between the organism and the disease is now almost complete, lacking only a demonstration of the contagious character of the disease set up by inoculation."

Recent work on pleuro-pneumonia contagiosa bovum in north Queensland, A. W. Turner, A. D. Campbell, and A. T. Dick (*Aust. Vet. Jour., 11 (1935), No. 2, pp. 63–71*).—This is a report of investigations of pleuropneumonia of cattle, commenced at the station at Townsville in north Queensland early in 1932. "The causal organism of pleuropneumonia is not a true filtrable virus, but a relatively large branching organism that produces filtrable sporelike bodies referred to as conidioids. It is able to reproduce by at least five distinct methods. We propose to group it under the Schizomycetes in a new order, Borrelomycetales, and to adopt for it the nomenclature *Borrelomyces peripneumoniae*. For the first time typical photographs have been taken of it in the living state by dark-ground illumination. Contrary to earlier belief, it can be easily stained in sections by suitable technic.

"A new medium, 'B. V. F.–O. S.' [B. V. F. (or V. F.)=viande foie (meat liver); O. S.=ox serum], is described, in which the organism grows luxuriantly and retains its viability and virulence for long periods. Cultures in it can with advantage replace 'natural virus' for immunization purposes.

"Some new pathological findings are discussed, including edema in the epidural space. The organism is pathogenic for sheep and goats in addition to cattle. It can frequently be isolated from the circulating blood and most internal organs. A complement-fixation test is discussed by means of which a very high percentage of chronic cases with lung sequestra can be detected; active or acute cases are invariably detected. Animals immunized by previous inoculation may occasionally contract the disease when exposed to prolonged contagion, but in mild form; moreover, they are not precluded from developing into 'carriers.' Various methods of diagnosing pleuropneumonia, based upon recent work, are reviewed."

Recent research into the "redwater" diseases of Queensland cattle, J. Legg (*Jour. Council Sci. and Indus. Res. [Aust.], 8 (1935), No. 2, pp. 79–85; abs. in Aust. Vet. Jour., 11 (1935), No. 2, pp. 78, 79*).—The author reports that the following parasites have been found associated with tick fever in Queensland cattle: "*Babesiella argentinum* Lignières 1903, *Anaplasma marginale* Theiler 1910, *Piroplasma bigeminum* Smith & Kilborne 1893, and *Theileria mutans* Theiler 1906." It has been found that carriers (1) of *P. bigeminum* are resistant to infection with *B. argentinum*, (2) of *B. argentinum* are susceptible to infection with *P. bigeminum*, and (3) of *A. marginale* are susceptible to both *B. argentinum* and *P. bigeminum* and vice versa.

Experiments on the value of protective inoculation against Theileria annulata of cattle, S. J. Gilbert (*Jour. Compar. Path. and Ther., 48 (1935), No. 2, pp. 112–116*).—The experiments performed (E. S. R., 58, p. 774), presented

in table form, do not indicate that premunition through blood inoculation is likely to be a useful method of protecting cattle against theileriasis as it exists in Palestine. It seems clear that a true immunity cannot be procured by this method.

The Australian cattle tick Boophilus microplus: The time between dipping and removal of cattle necessary to protect free areas, J. Legg (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 2, pp. 133–136*).—A brief report of experiments conducted.

Bovine trichomoniasis, H. S. Cameron (*Cornell Vet., 25* (*1935*), *No. 2, pp. 99–110*).—Female bovines affected with trichomoniasis tend to recover if they are not exposed to reinfection, although males remain as carriers. "There is no specific treatment for the infection. Probably uterine douches that remove pus and debris hasten recovery in the individual. It can be eliminated from the herd by the removal of infected bulls and by giving the infected females sexual rest."

Trichomoniasis in relation to reproduction in dairy cows.—Second report, M. A. Emmerson (*Penn. Univ., Vet. Ext. Quart. No. 59* (*1935*), *pp. 19, figs. 2*).—A review of the present status of knowledge of *Tritrichomonas fetus* and the disease caused by it in cattle, presented with a list of 20 references to the literature (E. S. R., 68, p. 530).

On transmission of tuberculosis by copulation. N. Plum (*Skand. Vet. Tidskr., 25* (*1935*), *No. 6, pp. 301–309; Swed. abs., pp. 308, 309*).—A report is made of observations on a large farm of the transmission of tuberculosis by bulls to heifers.

Peregrinations of the liver fluke in the organs of animals [trans. title], G. Bugge (*Berlin. Tierärztl. Wchnschr., 51* (*1935*), *No. 5, pp. 65–68, figs. 4; abs. in Vet. Rec., 15* (*1935*), *No. 25, p. 720*).—Investigations conducted have led the author to conclude that the immature liver fluke *Fasciola hepatica* reaches the liver by way of the portal vein, and only exceptionally by direct puncture of the liver capsule from the peritoneum as supposed by Ssinitzin in 1914 (E. S. R., 31, p. 758). An examination of several thousand young calves, of which 1.2 percent were found infected, resulted in the finding of flukes varying in size from 12 to 19 mm in the livers of animals 3 to 7 weeks old, indicating infection from maternal placenta followed by burrowing into the vessels and circulation of the fetus. A list is given of 19 references to the literature.

The prophylaxis of enzootic ataxia of lambs in Western Australia, H. W. Bennetts (*Jour. Council Sci. and Indus. Res.* [*Aust.*], *8* (*1935*), *No. 2, pp. 61–70*).—Although the etiology of enzootic ataxia is still obscure, "a working hypothesis was built up on chemical, clinical, and pathological data. It was postulated that the high calcium intake of ewes depastured on the affected cretaceous area led to the storage of traces of lead in the osseous system, and that stored lead was eliminated in the milk of lactating ewes (being on a lower calcium balance), resulting in lead intoxication of the progeny.

"The hypothesis that enzootic ataxia is a manifestation of plumbism has not yet been proved. Ammonium chloride was administered as a 'deleading' agent to gestating ewes. In two small controlled experiments at Gingin during 1933 and 1934 and one large-scale field experiment at Dandarragan during 1934, the results were very satisfactory. It appears that the consumption of lick containing approximately 16 percent ammonium chloride at the rate of 4 to 5 oz. per week during the gestation period will prevent the development of ataxia in the progeny under those conditions which have proved most conducive to the incidence of the disease. The favorable influence on the health and development of lambs from ewes so treated is remarkable. In one experiment

it was shown that even a much smaller lick intake (average 1.7 oz. per week) had a marked effect on the incidence of ataxia and development of lambs under most unfavorable conditions.

"Up to the present, no explanation of the success of this method can be given, but further extensive trials of ammonium chloride, as well as additional chemical and biochemical work, are projected."

On the biology of the infective larva of Monodontus trigonocephalus (Rud.) of sheep, T. W. M. Cameron (*Jour. Helminthol., 1 (1923), No. 5, pp. 205–214*).—This contribution is presented with a list of nine references to the literature.

Ecological studies on Nematodirus species in sheep in Manawatu district, New Zealand, J. H. Tetley (*Jour. Helminthol., 13 (1935), No. 1, pp. 41–58*).—Four species of *Nematodirus* found in the Manawatu district of New Zealand and here reported upon are, in order of abundance of males, *N. filicollis*, *N. spathiger*, *N. abnormalis*, and *N. helvetianus*.

Seasonal fluctuation in the number of eggs of trichostrongylid worms in the faeces of ewes, E. L. Taylor (*Jour. Parasitol., 21 (1935), No. 3, pp. 175–179, fig. 1*).—In studies conducted by the Ministry of Agriculture and Fisheries in England, it was found that "the number of eggs of trichostrongylid worms passed by breeding ewes is at a minimum during the winter months and rises to a peak in June, from which it falls again to the end of the year. The rise and fall in the numbers of eggs passed by the ewes does not appear to synchronize with the rise and fall in the intake of infective larvae."

The behaviour of sterilised exsheathed infective trichostrongylid larvae in sterile media resembling their environment in ovine hosts, G. Lapage (*Jour. Helminthol., 13 (1935), No. 2, pp. 115–128*).—Attempts were made by the author to cultivate in sterile artificial media the sterilized first parisitic larva of intestinal nematodes of sheep. These larvae (*Haemonchus contortus*, *Ostertagia circumcincta*, and *Trichostrongylus* spp.) were obtained by artificial production of the second ecdysis in 1 in 20 dilutions of Milton hypochlorite in distilled water. Over 1,500 larvae were thus isolated, usually in hanging drops, in more than 200 different sterile media, containing ingredients likely to be present in the normal environment of these larvae inside their hosts.

"None of the larvae showed any growth. Most formed the next sheath and were ready for the third ecdysis, but only 10 larvae actually performed this. The parasitic third larva thus liberated always emerged by a rent at the side of the eosophageal region of the sheath, and never by detachment of a cap like that characteristic of the second ecdysis. In every instance the parasitic third larva died immediately after the third ecdysis, which set it free. Two of these 10 larvae underwent the second and third ecdyses simultaneously.

"The methods used by the writer to induce artificially the second ecdysis always failed to produce the third ecdysis. No method of producing this at will was found.

"The longest time any first parasitic larva lived was 41 days. Few of them lived, however, less than 8 to 10 days. A life of 18 to 30 days was more usual before visible signs of physiological abnormality appeared, such as the gradual vacuolation and emptying of the intestinal cells which usually preceded their death.

"Those which were ready with a loose sheath for the third ecdysis showed, as infective larvae also do, remarkable powers of resistance to changes produced in them by osmotic factors.

"None of the larvae showed any particular reaction to blood, mucosa of the stomach or duodenum, nor, indeed, to any of the ferments or tissues these larvae

encounter in their hosts. They seemed to be as indifferent in this respect as the sheathed infective larvae are."

Soil, iron, copper and iron in the prevention and treatment of anemia in suckling pigs, H. C. H. Kernkamp (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 1, pp. 37–58, figs. 7*).—The results of an investigation conducted at the Minnesota Experiment Station with a view to obtaining more specific information on the relation of soil to the disease of new-born and baby pigs called "anemia of suckling pigs", and a review of the literature are presented.

It is pointed out that under natural conditions, especially in regions north of 40° N. Lat., the disease is more prevalent in the late winter and early spring seasons of the year. This is considered to be due to the fact that early farrowed pigs must be confined indoors.

"Spontaneous recovery from the disease is not uncommon although the pigs may still be living under the conditions favorable to its development. Spontaneous recovery begins shortly after the pigs begin to take cereal food. In point of time, this is usually about the fifth to seventh week after birth.

"The ultimate cause of anemia in suckling pigs is a deficiency of iron in their diet. This conclusion is reached from the fact that the syndrome characterizing the disease did not develop when iron was administered to suckling pigs in amounts equal to 4 or 5 mg per kilo body weight.

"While we have no definite knowledge with regard to what element or elements of the soil contributed to its value as a preventive of anemia in suckling pigs, we presume it was the iron.

"The blood picture characterizing this disease in suckling pigs resembles the blood picture of the infantile type of chlorosis in humans."

Avitaminosis A in swine, C. Elder (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 1, pp. 22–30, figs. 4*).—This contribution from the Missouri Experiment Station reports upon a study made of a disease affecting several hogs weighing from 110 to 120 lb. and just coming off of a weanling-pig experiment. It was diagnosed as avitaminosis A in swine or vitamin A deficiency. The trouble developed in pigs which were well fed, well cared for, and had received a ration that was considered to be adequate in vitamin A content. The same ration was fed for four consecutive years to the same class of pigs, but the only trouble of this kind ever observed on this farm was in the third year, or 1933. In attempting to supply vitamin A to the ration and correct the symptoms observed, best results were obtained when affected animals were allowed to run on good bluegrass pasture.

"Microscopic examination of the spinal cord and sciatic nerves showed unmistakable evidences of a fatty change or a myelin degeneration when this examination was made early or shortly after the first symptoms of incoordination developed. After several weeks had elapsed, even though the animals still showed symptoms, it was not possible to demonstrate the fatty change when employing the same technic. . . . In another experiment young shoats that were fed experimentally a ration known to be deficient in vitamin A developed symptoms of avitaminosis A in as short a time as 2 mo., but in most of our animals it took about 90 days or longer before many cases were produced. The most characteristic symptoms observed were diarrhea, emaciation, muscular incoordination, blindness, dermatitis, intense itching, and in white hogs a marked pink color of the skin. Resistance to secondary infections was greatly lowered.

"When severely affected animals were changed to a good ration and sufficient vitamin A was made available, marked improvement was noticed in from 7 to 10 days. Complete recovery, if it does take place, requires a much longer time. We found sufficient vitamin A was made available when we added high

grade cod-liver oil (tested for vitamin A content) to the extent of 1 percent of the ration, or when we added fresh green feed, cut daily, or well-cured alfalfa hay with a good green color."

Necrotic enteritis of the pig and its differential diagnosis, F. Beckett (*Vet. Jour., 91 (1935), No. 6, pp. 259–277*).—This discussion is presented in an attempt to show that in a great number of outbreaks of suspected hog cholera the disease is in reality necrotic enteritis. While hog cholera attacks pigs of all ages, necrotic enteritis is confined to pigs under 6 mo. of age.

The partial purification of Balantidium coli from swine, R. W. Glaser and N. A. Coria (*Jour. Parasitol., 21 (1935), No. 3, pp. 190–193*).—A report upon the use of a semisolid and a liquid medium in the cultivation of *B. coli* of swine.

"A partial purification of the ciliate was effected by permitting it to migrate through the semisolid gel in 'V' tubes. By taking advantage of the described technic more positive initial cultures were obtained than by the usual procedures. This was due to the fact that many bacteria injurious to the protozoan were eluded. Following the partial purification, *Balantidium* was regularly held in the semisolid medium without transplantation for 7 days and sometimes for from 10 to 12 days. *Balantidium* transferred from the purification tubes to the liquid medium often failed to develop. A slow adaptation from the semisolid gel to the fluid was obtained with most of the strains. When once adapted to the liquid environment, certain strains of *Balantidium* remained alive and transferable for long periods of time. One strain has been transplanted every 20 days and has thrived for over 2½ yr."

Observations on natural cases of kidney-worm infestation in swine with special reference to practical method of diagnosis, Z. de Jesus (*Philippine Jour. Anim. Indus., 2 (1935), No. 1, pp. 49–65, pls. 2*).—The author found that the incidence of kidney worm infestation in swine, at least in the Provinces of Batangas and Laguna, where swine are raised almost individually, is 63.98+ percent. Had these swine been raised on a commercial scale it is considered highly probable that the incidence of infestation would have been higher.

"Among mature swine, except in very rare cases, no symptoms are manifested by the affected animals that could be considered as characteristic of stephanuriasis. The salient symptoms of stephanuriasis in young pigs are stuntedness, cachexia, emaciation with poor appetite, and sometimes with tucked-up abdomen and arched back. Diagnosis based on these symptoms alone is likely to be fallacious in view of the fact that other worm infestations, such as ascariasis and metastrongylosis, may often produce the same symptoms.

"In young pigs, ranging in age from 3 to 6 mo., most of the kidney worms are found in the perirenal fat, kidneys, and ureters; and the frequency of involvement is almost the same for the liver, perirenal fat, and kidneys. In all cases of natural infestation in both mature and young swine, the sexually mature worms were found in the perirenal fat, cortices of the kidneys, in the walls and interior of the pelvises of the kidneys and ureters.

"Diagnosis by urine examination for the detection of kidney worm eggs is, to a certain extent, the most practical and reliable, and due to its simplicity as herein described suspected animals could be examined at close intervals. Even young pigs from 3 to 5 mo. old discharge kidney worm eggs with their urine, showing that both mature and young infested pigs act as disseminators of the eggs of *Stephanurus dentatus* in the piggery."

Necator americanus and the domestic pig, T. Goodey (*Jour. Helminthol., 1 (1923), No. 4, pp. 161–164*).—The author's attempts to infect pigs with larvae

of *N. americanus*, both by skin penetration and by the mouth, proved entirely negative.

Some observations on Necator suillus Ackert and Payne 1922, J. J. C. Buckley (*Jour. Helminthol., 13 (1935), No. 2, pp. 67–76, figs. 3*).—The morphological, biological, and experimental data recorded have led to the conclusion that the attempt to merge *N. suillus* in the synonymy of *N. americanus*, as proposed by Gordon (E. S. R., 48, p. 182) and others, is utterly unjustified.

Fistulous withers and poll evil, J. N. Frost and B. J. Errington (*Cornell Vet., 25 (1935), No. 2, pp. 177–183*).—A brief review of the status of knowledge of these affections, presented with a list of 12 references to the literature.

The use of saturated sodium chloride solution as a larvicide in the control of the dog hookworm Ancylostoma caninum, P. C. Underwood (*North Amer. Vet., 16 (1935), No. 3, pp. 41–43, 44*).—It is concluded from experiments conducted that a saturated solution of sodium chloride destroyed the hookworm larvae (*A. caninum*) on the soil of the pen in which it was sprinkled and prevented hookworm infestation in the dogs maintained on such soil.

[Work in avian pathology by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1934], pp. 79, 80*).—A brief account is given of the progress of work (E. S. R., 71, p. 394) with infectious rhinitis (coryza) of chickens, caused by *Hemophilus gallinarum*, with a turkey coryza, and with the value of drugs in coccidiosis.

The toxicity of Glottidium vesicarium (Jacq.) Harper seeds for the fowl, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 1, pp. 13–21, fig. 1*).—In work at the Florida Experiment Station 150 seeds of *G. vesicarium*, a common plant in the State with which birds running at large may come in contact, proved fatal for Single Comb White Leghorn adults when force fed in a single dose. "Well-fed birds refused to eat the seed voluntarily; semistarved birds ate some seed but not enough to prove fatal. The most consistent macroscopic lesions were necrotic enteritis and necrosis of the lining of the bulbous portion of the gizzard. Microscopically the hepatic cells showed fatty degeneration; the remaining parenchymatous organs and all involuntary muscle studied were in a state of cloudy swelling; proliferation of histiocytes took place within the glomeruli. Two cases of natural poisoning by the seeds of *G. vesicarium* have been observed. These birds presented lesions typical of our experimental acute cases of poisoning."

Cocco-bacilliform bodies associated with an infectious fowl coryza, J. B. Nelson (*Science, 82 (1935), No. 2115, pp. 43, 44*).—Two distinct clinical types of fowl coryza have been found by the author in a study of material secured from infected flocks in the vicinity of Princeton, N. J. The interval elapsing (onset) between the injection of exudate in susceptible fowl and a nasal discharge is short, in one case, 1 to 3 days, and prolonged in the other, 1 to 4 weeks. In both types the nasal discharge generally persists for 2 mo. and often for a longer period. *Hemophilus gallinarum* is not associated with the coryza of slow onset, attempts to isolate it from the nasal passages of infected birds having repeatedly failed. Generally the exudate does contain other bacteria, most of which grow freely in cultures. It can be said with certainty that all these bacteria are secondary invaders and of no direct etiological significance. The responsible infective agent is unable to pass through Berkefeld V candles of average permeability.

"Exudate from two birds originally infected with filtrate has been carried on in series by passage from infected to susceptible birds. Films made directly from this exudate, which regularly contains few bacteria, have constantly

shown minute Gram-negative coccobacilliform bodies. They are commonly extracellular, occurring singly, in pairs, or in loosely formed aggregates, but may also be found intracellularly within both phagocytic and epithelial cells. They vary somewhat in size, with an estimated range of 0.1μ to 0.5μ, many of them approaching the limit of visibility with the ordinary microscope. Early in the disease the bodies are generally numerous, but in some cases their detection requires a prolonged search. The same bodies are also present in films made from the nasal passages of birds injected with unfiltered exudate. Their detection is often more difficult in this case, due to the presence of numerous bacteria.

"All attempts to cultivate these bodies, either aerobically or anaerobically, in artificial media have met with failure. In several instances, however, there has been isolated a minute Gram bacillus which tends to form compact clumps in fluid cultures. This organism, which is not pathogenic, bears a superficial morphological resemblance to the coccobacilliform bodies, and like them is capable of passing through certain Berkefeld V candles. Whether or not it is in any way related to these bodies cannot be stated at present.

"The injection of exudate from birds infected with the coryza of rapid onset into birds which have recovered from the coryza produced by injection of *H. gallinarum* is often followed by a coryza of slow onset which may be reproduced in series. *H. gallinarum* is not present in the exudate in these cases. Stained films, however, show coccobacilliform bodies indistinguishable from those which characterize the more naturally produced disease. These findings suggest that the coryza of rapid onset and long duration is in reality a mixed infection in which both *H. gallinarum* and the present virus, of undetermined nature, are operating. Such a relationship would offer an adequate explanation for the previously noted discrepancies in the coryzas produced by exudate and culture, respectively."

Reference is made to the findings of Gibbs (E. S. R., 73, p. 395).

Fowl paralysis: "Range paralysis"—neuro-lymphomatosis gallinarum, G. C. McLennan (*Aust. Vet. Jour., 11 (1935), No. 2, pp. 42–62, figs. 4*).—This contribution deals with the clinical and pathological findings in fowl paralysis as it appears in South Australia, and reports upon an experimental study of its etiology. Experimental transmission of the disease by inoculating fertile eggs and the chorioallantoic membrane of 10-day chick embryos failed, with one possible exception. The intracerebral inoculation of day-old chicks was also not successful.

A list is given of 36 references to the literature.

Serological studies on adult carriers of pullorum disease, R. E. Greaves, R. S. Dearstyne, and H. C. Gauger (*North Carolina Sta. Tech. Bul. 48 (1935), pp. 16, figs. 3*).—A study of the fluctuating character of the antibody content of the serum of certain types of bird carriers of pullorum infection, resulting in the so-called "intermittent" reactor, and of the relationship of the delivery of infected eggs of the carrier birds to their respective serum titer is reported upon, the details being given in table and graph form.

In the course of the work, serological studies were made of 53 adult reactors to the macroscopic agglutination test for *Salmonella pullorum* infection obtained from groups of birds tested from 2 to 6 yr. at bimonthly intervals. "Of the 53 birds under test, 40, or 75.5 percent, of these reacted intermittently to the test, one or more negative tests being secured during the periods of study. The general tendency as observed in these studies was for an increase in mean serum titer of the reacting birds as they aged, with a corresponding reduction of the percentage of negative tests secured. In the 3,000 tests run on the 40

reactors showing intermittency in reaction, 233 negative phases were encountered, these ranging from 1 to 15 consecutive negative tests.

"No correlation could be established between delivery of infected eggs and mean serum titer. Likewise, no relationship could be established between appearance of positive or negative phases or as to their duration. The results of bacterial tests of 14,053 eggs delivered by carrier birds are noted. Of these, 1,900, or 13.1 percent, showed the presence of *S. pullora*. The tendency of this study indicates a reduction in percentage of positive eggs delivered by carrier birds as they age."

A list is given of 12 references to the literature.

The persistence of avian tubercle bacilli in soil and in association with soil microorganisms, C. Rhines (*Jour. Bact.*, *29* (*1935*), *No. 3*, *pp. 299–311*).—In studies at the New Jersey Experiment Stations a plate count was made periodically of soil infected with tubercle bacilli in the presence of complex microbiological populations by a suitable method that was developed. A strain of the avian tubercle bacillus employed, known as "Avian 531", was found to multiply in sterile soil and when associated with pure cultures of some soil bacteria. Under the conditions of this same experiment, a fungus checked the development of the avian bacillus, especially in manured soil. However, "in general, bacteria, fungi, and actinomycetes did not markedly depress the number of tubercle bacilli in soil when cultured in association with the tubercle bacilli. Avian 531 tubercle bacilli survived in toluol-sterilized soil for long periods under a variety of conditions. Recovery from toluol-sterilized soil was made after 3 mo. The death rate was slow. Avian 531 tubercle bacilli were slowly destroyed in soil which had not been sterilized. The plate count numbers were reduced to about one-sixth of the original counts in 1 mo. If the same death rate continued, the tubercle bacilli inoculated into the soil would survive for many months."

Age resistance of chickens to the nematode Ascaridia lineata (Schneider), J. E. Ackert, D. A. Porter, and T. D. Beach (*Jour. Parasitol.*, *21* (*1935*), *No. 3*, *pp. 205–213*, *figs. 2*).—Nine tests involving 382 chickens were conducted at the Kansas Experiment Station in order to determine the degree of age resistance of chickens to the intestinal nematode *A. lineata*. "The chickens were purebred, Single Comb White Leghorns secured as day-old chicks from tested commercial hatcheries; they were raised helminth-free until parasitized with embryonated eggs of the nematode *A. lineata*. After 3 weeks of parasitism, the chickens were killed and the nematodes isolated, counted, and measured. The basis for judging the degree of host resistance to the nematode was the average worm length per group of chickens. In the first five tests each chicken was fed 50 eggs, and in the remaining four tests each bird was given 300 eggs. The tests in which 50 eggs were fed were made on groups of chickens examined at the following ages: 58 days, 63 days, 71 days, 84 days, and 114 days; those to which 300 eggs were fed were examined at the ages of 45 days, 63 days, 71 days, and 93 days, respectively.

"When 50 eggs were fed, the worms were found to be significantly shorter in the 63-day group than in the 58-day group of chickens, and those in the 78-day group were markedly shorter than the worms from the 63-day group. The worms from groups 84 and 114 days of age were shorter than the previous ones, but not significantly so. When 300 eggs were fed, significantly increased resistance was demonstrated by the worms from the 63-day group as compared with those from the 45-day group. Likewise, the worms from the 71-day group were markedly shorter than those from the 63-day group; and the worms from the 93-day group were significantly shorter than those from the 71-day group of chickens.

"Thus the results of these experiments demonstrate a marked increase in the resistance of chickens to the growth of the intestinal nematode *A. lineata*. Starting with chickens 45 days of age, significant differences in the lengths of the nematodes were noted up to 93 days of age, when the maximum resistance is ordinarily reached.

"The explanation of these results and of those from closely related experiments does not lend itself to the abnormal host theory nor to that of a growth-promoting power. The most plausible explanation is that as the chicken grows older its body develops more potent growth-inhibiting factors which react against the development of the nematodes."

A list of 27 references to the literature is included.

Comparative resistance of Bronze turkeys and White Leghorn chickens to the intestinal nematode Ascaridia lineata (Schneider), J. E. Ackert and L. L. Eisenbrandt (*Jour. Parasitol., 21 (1935), No. 3, pp. 200–204*).—With a view to comparing the resistance of Bronze turkeys and White Leghorn chickens of the same age to the viability and growth of the intestinal nematode *A. lineata*, two experiments were carried out at the Kansas Experiment Station. The individual birds under comparison were given the same number of embryonated eggs of *A. lineata*.

"The period of parasitism in the first experiment was 1 mo., that for the second, 3 weeks. In both experiments the turkeys harbored fewer nematodes than did the chickens. In the second experiment the nematodes from the turkeys were significantly fewer in number and shorter in length than were those from the chickens. There was no evidence that the turkeys are the natural hosts, nor that the chickens are the abnormal hosts and hence more resistant than the turkeys to this nematode.

"White Leghorn chickens at approximately 2 mo. of age are probably greater factors in the spread of the intestinal roundworm *A. lineata* than are Bronze turkeys of the same age."

A study of the moisture requirements of the eggs of the chicken ascarid Ascaridia galli, A. McRae (*Jour. Parasitol., 21 (1935), No. 3, p. 220*).—In a study made of the moisture requirements, the common chicken ascarid *A. galli* was shown to be far less resistant than the horse and dog ascarids, *Parascaris equorum* and *Toxocara canis*, which at 22° C. develop in relative humidities as low as 40 to 50 percent and 77 percent, respectively. The eggs of *A. galli* apparently have about the same moisture requirements as those of the human and pig ascarid, since the chicken ascarid egg did not survive an average relative humidity below 81 percent at 22°.

Syngamus trachea. The longevity of the infective larvae in the earthworm. Slugs and snails as intermediate hosts, E. L. Taylor (*Jour. Compar. Path. and Ther., 48 (1935), No. 2, pp. 149–156, fig. 1*).—Observations by the author reported show that the larvae of *S. trachea* retain their infectivity for the chick in earthworms for upward of 3½ yr. "The genus *Syngamus* probably has close affinities with the Metastrongylidae. Feeding experiments with land mollusks show that *Agriolimax agrestis*, *Helix aspersa*, *Cepea hortensis*, and *Helicella heripensis* are capable of acting as intermediate hosts in a similar way to the earthworm. The larvae were found to be situated in several different tissues, but in *A. agrestis* there appears to be a preference for the nerve ganglia; out of a total of 23 larvae found in 1 of these slugs, 15 were observed to be situated in the nerve ganglia of the head. Feeding experiments with three species of flies, and with a variety of other possible intermediate hosts, did not result in infection.

"Measures directed at the control of earthworms, slugs, and snails are indicated where it is desired to eradicate *S. trachea* from restricted premises."

On the experimental transmission of Syngamus trachea from starlings to chickens, P. A. CLAPHAM (*Jour. Helminthol., 13 (1935), No. 1, pp. 1, 2*).—The author has found by feeding infested earthworms that the starling strain of the gapeworm (*S. trachea*) is very infective in chickens, and that starlings are of considerable importance in the spread of the disease.

The life-history of Syngamus trachealis (Montagu) v. Siebold, the gapeworm of chickens, R. J. ORTLEPP (*Jour. Helminthol., 1 (1923), No. 3, pp. 119–140, figs. 3*).—In the studies reported, presented with a list of 24 references to the literature, the author found that the female gapeworm *S. trachealis* can and does lay eggs, and that the eggs in the body of living worms do not develop beyond the 16-celled stage. The eggs passed in the feces of chickens are in the same stage of development as those in the uteri of the adult; they take about a week to develop and produce infective larvae, when cultured in well-aerated water at a temperature of about 25° C. "The embryos undergo only one molt before reaching the infective stage. The second stage or infective larvae are generally ensheathed. They are nonclimbers, do not penetrate the skin, and cannot resist desiccation. In the body of the host the larvae soon reach the lungs, where they grow considerably in size and undergo two further molts. The final or fourth stage larvae are reached in about 5 days after infection. The larvae then copulate and migrate into the trachea, where they attain sexual maturity in from 10 to 14 days later. The whole life cycle is completed within a month."

On nodules occasioned by gapeworm in pheasants, P. A. CLAPHAM (*Jour. Helminthol., 13 (1935), No. 1, pp. 9–12, fig. 1*).—Infestation of a covey of 15 pheasants about 1 mo. old that had been reared under hens resulted in the death of 6 within a period of 6 days. Upon examination death was found to have been due to an asphyxiation, caused, however, not by the gapeworms but by the development of nodules which caused a serious blockage. In one case there were 3 nodules, corresponding to 3 worms, each of which had reached the size of a small pea. They were obvious externally as well as internally in the tracheae.

Reference is made to the studies of its life history by Ortlepp, above noted.

The treatment of gapeworm disease, P. A. CLAPHAM (*Jour. Helminthol., 13 (1935), No. 1, pp. 3–8*).—In experimental work with garlic oil, which is excreted by the lungs, it was found necessary to administer by means of a pipette which could be inserted back into the throat and the anthelmintic gaged by minims. Some 50 birds between the ages of 13 and 22 days were employed, ⅛ to 3 minims of pure oil being administered. It was found that the parasites are markedly affected, and through some reaction the body wall is weakened and ruptured, allowing the genitalia to escape and be exposed. That the action of garlic is very powerful is also shown in the fact that all the eggs recovered are sterilized, even though the worms may be retained within the body for a longer or shorter period after treatment.

Treatment twice a day with 1 cc of a 5-percent solution of carbon tetrachloride in thick medicinal paraffin administered orally by means of a pipette often gave considerable relief.

The treatment of gapes in chickens by mechanical removal of the parasitic worms, E. L. TAYLOR (*Vet. Rec., 15 (1935), No. 24, pp. 692, 693, figs. 2*).—A description is given of an instrument which provides a quick and efficient method of removing the gapeworm *Syngamus trachea*. In one instance 45 pairs of immature worms were removed from an experimentally infected chick within 25 sec. "The chick's respiration remains disturbed for a time after the operation is completed, but this soon passes off, and, as at the age

of 7 or 8 weeks the chick becomes immune to infection with this parasite, one treatment is usually enough to effect a complete and permanent cure."

A contribution to the study of the blood parasites of some Indian birds, I. FROILANO DE MELLO (*Indian Acad. Sci. Proc., 1 (1935), No. 7, Sect. B, pp. 349–358, figs. 6*).—A description is given of the blood parasites found in four Indian birds—*Herodias intermedias* Wagler, *Gallinula chloropus* L., *Machlolophus xanthogenys* (Vigors), and *Chloropsis aurifrons davidsoni* Baker. A list of 15 references to the literature is included.

Acariasis of the canary (Serinus serinus L.) [trans. title], T. JOAN (*Bol. Min. Agr. [Argentina], 36 (1934), No. 3, pp. 229–234, pls. 5*).—The attack by *Proctophyllodes glandarinus* (Koch), *Analges passerinus* (L.), and *Picobia bipectinata* (Haller) of the feathers and of parasitism by the chicken mite are noted.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Massachusetts Station], C. I. GUNNESS (*Massachusetts Sta. Bul. 315 (1935), pp. 8, 9*).—The progress results are briefly presented of investigations of apple storages and apple washers and on a rural electric survey.

Construction of irrigation wells in Colorado, W. E. CODE (*Colorado Sta. Bul. 415 (1935), pp. 43, figs. 26*).—A large amount of technical information is presented relating to large excavated wells, metal well casing, tools and methods used in sinking metal-cased wells, development of metal-cased wells, test-hole drilling, design of metal-cased wells, well characteristics, and well contracts and cost of wells.

In an endeavor to obtain information on the effect of diameter on discharge, several experiments were made at different places. In each case, wells of more than one size were involved, and in order to correlate results, many gravel samples were taken. Mechanical analyses were made of all the samples, and each was subjected to a percolation test.

The results of some of these experiments are presented.

Rates of flow from porous hose, F. E. STAEBNER (*Agr. Engin., 16 (1935), No. 5, p. 193*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering data are presented showing the quantities of water which ooze through the walls of porous irrigation hose per 100 ft. of length for pressure heads varying from 3 to 7 ft.

Using porous hose in high row crops, O. E. ROBEY (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 225–228, figs. 3*).—Technical information is given as to the use of a hose-moving reel.

The design of stilling basins for small dams and weirs, G. B. DRUMMOND (*Agr. Engin., 16 (1935), No. 8, pp. 319, 320, fig. 1*).—In a contribution from the Oklahoma Agricultural and Mechanical College a mathematical analysis is presented of the factors involved in the prevention of erosion at the toe of a dam and of flow over small check dams.

Tabular data applicable to the design of soil-saving and check dams are given, together with several practical examples.

The SCS erosion control program, T. B. CHAMBERS (*Agr. Engin., 16 (1935), No. 8, pp. 301–303, figs. 4*).—This program is briefly outlined.

Results of recent engineering studies in soil erosion control, F. O. BARTEL (*Agr. Engin., 16 (1935), No. 8, pp. 304–307, 312, figs. 4*).—In a contribution from the U. S. D. A. Soil Conservation Service the results of studies conducted on the Central Piedmont Soil Erosion Farm at Statesville, N. C., are presented and discussed.

Engineering studies now under way at the farm include investigations of the rates of soil and water losses from terraced and unterraced land; the effect of differences in land slopes and soil conditions upon such losses; the most practical grade, height, spacing, and shape of terraces; the cost of terrace construction, terrace maintenance, and cultivating terraced lands; the proper method of laying off crop rows; and the economical use and development of farm machinery and other problems relating to terraces and their use. The construction of check dams and soil-saving dams, the control and reclamation of gullied land, the effect of subsoiling eroded soil, and the study of moisture losses and crop yields are phases of the engineering studies projected or under way. The most fundamental of all of these investigations is the determination of the comparative soil and water losses from unterraced, terraced, and wooded areas.

In spite of more favorable conditions of soil and slope and heavier crop cover, the unterraced area lost 8.5 times as much soil during 1932 as did the terraced area. In 1933 the unterraced area lost 10 times as much soil, and the total run-off was 48 percent greater and the maximum rate of run-off attained was almost 5 times as much.

The terraces showed a consistent variation in both run-off and erosion with increase in grade of the terrace channel. As compared with the variable grade terrace, the terrace with 6 in. fall in 100 ft. lost 44 percent more soil and that with 9 in. in 100 ft., 64 percent more soil. Considering these results, and from observation of the terraces as a whole, it is believed that about 4 in. fall in 100 ft. should usually be considered a maximum for good terracing practice and that variable graded terraces are preferable to uniform grade terraces.

With reference to terrace spacing, the conclusion is that other factors, such as uneven silting and ponding in the terrace channel, uneven topography, etc., may have greater influence on the amount of erosion and run-off than the spacing. As the inter-terrace areas become more stabilized, these intangibles will exert less influence and the direct effect of variation in spacing can be better measured. Judging from results obtained to date, it would seem that 5- to 7-ft. spacings on slopes up to 12 percent, especially on short terraces, would not result in excessive soil losses. The evidence also points to the possibility of building considerably longer terraces than was formerly thought permissible.

Engineering experiments in soil erosion control in the Northwest, P. C. McGrew (*Agr. Engin., 16 (1935), No. 5, pp. 187–189, figs. 3*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering the engineering experiments used in connection with the development of soil erosion control methods in Oregon, Washington, and Idaho are briefly described.

Selection of channel grade for terraces, H. S. Riesbol (*Agr. Engin., 16 (1935), No. 8, pp. 308–312, figs. 3*).—Studies conducted by the U. S. D. A. Soil Conservation Service are reported which indicated that under conditions of fallow or clean cultivated row crop the soil removed from the drainage area above the terrace channel is controlled largely by the vertical spacing of the terraces. The time of concentration of flow from any terrace decreases as the grade of the terrace channel is increased. This results in high velocities of flow in the channels of steeper gradient. Maximum rate of run-off per acre increases directly with an increase in the grade of the terrace channel, and it is therefore necessary that the terraces of steeper grade have greater channel capacity at the lower end and that the capacity of terrace outlet structures be increased accordingly.

Deltas of silt which remain in the channel of the level terrace due to low velocity of flow are responsible for the formation of long and shallow ponds. In the Red Plains region this pondage creates the following conditions not encountered in the graded terraces: (1) Total run-off from the level terrace is less than that from the graded terraces. The difference is held in the ponds in the level terrace channel from which it is dissipated by evaporation. (2) The crop yield from the level terrace is lowered due to drowning of the crop in the channel. (3) Tillage operations are often delayed in the channel of the level terrace as compared with the graded terraces by wet soil conditions.

The rate of removal from the terrace channel of soil deposited there by run-off from the inter-terrace area increases directly with the increase in the grade of the terrace channel.

If the channel of a terrace is maintained uniformly level, the water flowing in that channel will be at a nearly constant depth from one end of the terrace to the other. The probability of water overtopping the ridge at a low point is equally great regardless of distance from the outlet. In a graded terrace the water is conducted quickly to the outlet, and it is only the lower section of the terrace ridge which needs careful maintenance. If the grade is excessive, that is, over 4 in. per 100 ft., the water tends to pile up at the lower end, and this section of the ridge must be maintained at excessive height.

Terrace outlets, W. D. Ellison (*Agr. Engin., 16 (1935), No. 8, pp. 298–300, 303, figs. 4*).—In a contribution from the U. S. D. A. Soil Conservation Service the technic employed in terrace outlet design is briefly described and some design data presented in graphic form.

The methods used for controlling erosion in terrace outlets are (1) control with a low-growing perennial grass having an extensive root system and which provides a permanent vegetal cover and (2) control with mechanical works. Mechanical works are used where large quantities of water are concentrated and at points where vegetation cannot give sufficient protection.

Design and construction of sodded terrace outlet channels, H. Matson (*Agr. Engin., 16 (1935), No. 8, pp. 321, 322, 330, fig. 1*).—On the basis of experiments conducted by the U. S. D. A. Soil Conservation Service, tabular data are presented showing the theoretical depth of water and bed width of channel for various slopes and quantities of run-off at increments of 10 sec.-ft. For slopes of from 6 to 10 percent, the cross section is designed for a maximum mean velocity of 8 ft. per second to carry the probable run-off from the maximum rainfall intensity to be expected during a 10-yr. period.

The cross sections for 4 and 5 percent have been designed for a maximum mean velocity of 7 ft. per second, and for 6 ft. per second at 3 percent, in order to avoid having the excessive depth of water in the channel which would be necessary to produce a velocity of 8 ft. per second.

Cost of terracing in Iowa, Q. C. Ayres (*Agr. Engin., 16 (1935), No. 8, pp. 317, 318, figs. 2*).—In a contribution from the Iowa Experiment Station cost data are summarized and discussed which were obtained from terracing operations on 145 farms in 18 counties in southern Iowa.

A soil moisture meter depending on the "capillary pull" of the soil, with illustrations of its use in fallow land, grass orchard, and irrigated orchards, W. S. Rogers (*Jour. Agr. Sci. [England], 25 (1935), No. 3, pp. 326–343, pl. 1, figs. 7*).—In a contribution from the Horticultural Research Station, East Malling, Kent, England, a soil moisture meter which gives direct and continuous measurement of the soil moisture content is described.

The instrument consists of a special porous pot filled with water, connected by a tube to a mercury manometer. The pot is buried in the soil, and its

capillary pull causes the mercury to rise. The height to which the mercury rises depends on the amount of moisture in the soil, and also on the size of the soil particles and the degree of compactness of the soil. (The last two factors remain constant for an instrument in one position.) To read actual moisture percentage each instrument has to be calibrated for the soil in which it is placed. Once this is done, all sampling and weighing is eliminated.

The range of the instrument in its present form runs from saturation to about 1.5 percent moisture (calculated on dry weight) in sand, to about 8 percent in light loam, and to about 21 percent in heavy clay. Within this range increases and decreases of soil moisture are recorded rapidly and consistently. This type of moisture meter is prevented from giving absolutely precise readings of the soil moisture content by the fact that the moisture : pressure-deficiency curve tends to form a hysteresis loop, i. e., does not follow exactly the same course for rising moisture as for falling moisture. The degree of accuracy appears to be sufficient for many purposes, however, for the variability is usually within 10 percent. Special devices are used to prevent freezing and enable the instrument to give a record over long periods without attention in the field.

Examples of the working of this moisture meter in the laboratory and in the field are given. Instruments placed at different depths in clean cultivated land and in grass orchards showed the contrast between loss of water by evaporation, which hardly affects the soil moisture at 30 in., and loss by root absorption which draws on the deeper layers as well as the surface layers of the soil. In an irrigated orchard the meters showed the penetration of irrigation water and the drying out of the soil at various depths.

An appendix describes the design and construction of the meter found most satisfactory under field conditions.

Determining colloids in soil for rammed earth construction, R. L. Patty (*Agr. Engin., 16 (1935), No. 7, pp. 275, 276, figs. 2*).—In a contribution from the South Dakota Experiment Station, methods developed for determining colloids in soil to meet the requirements of efficient rammed earth construction are described and tests thereof reported.

It was found that the hydrometer method of analysis lends itself very satisfactorily to work with rammed earth. Test data indicate a definite relationship between the colloidal content of the soil and the quality of the wall made from it. If the total colloids in the soil run 40 percent the soil is doubtful, and if it goes above this point the soil is unquestionably unfavorable. It is quite certain this dividing line will not range more than 1 percent either above or below 40, since this study included 29 quite different soils from far distant localities and no exception was found. It should therefore be possible in 30 minutes' time to determine whether or not a soil is favorable for pise work by making the test for colloids.

The farm tillage machinery laboratory, J. W. Randolph and I. F. Reed (*Agr. Engin., 16 (1935), No. 6, pp. 219, 220, figs. 2*).—This laboratory, which is operated by the U. S. D. A. Bureau of Agricultural Engineering in cooperation with the Alabama Experiment Station, is described and illustrated, and a brief description of the studies contemplated is presented.

The design and development of a farm implement, T. Brown (*Agr. Engin., 16 (1935), No. 7, pp. 261–267, figs. 21*).—This paper, which is based on the design and development specifically of the manure spreader, is intended to enumerate and illustrate the various processes involved in the experimental development of a specific farm implement.

A new method of obtaining dust for testing tractor air cleaners, F. A. Brooks (*Agr. Engin., 16 (1935), No. 8, pp. 323–326, figs. 6*).—In a contribution from the California Experiment Station a new method of obtaining dust for testing tractor air cleaners is described which involved the development of a sedimentation chamber built of 1¼ in., full-width ponderosa pine boards, Nos. 1 and 2 clears, with all joints splined and glued. The straight run is 36 ft. long, is framed with oak, and is painted both inside and outside. The filter cloth screen used at the discharge end to intercept all dust particles smaller than 5μ in diameter is in a deep V to offer extended surface, and the cloth is vertical to permit shaking off the dust without disassembling. These complications were found necessary because the dust is not evenly dispersed in the air stream and the upper or lower part of the screen may fill up first, forcing the air stream out of a straight laminar flow toward the more pervious area.

To collect the particles of various sizes from different parts of the chamber floor, three removable floor sections are provided giving direct access to the entire chamber, the dust being collected by rubber scrapers.

An apparatus was developed to introduce the dust and clear air at the head of the chamber. The entrance to the straight run has a honeycomb, and the entire cross-sectional area is divided into 15 equal sections with the air flow to each under manual control. The dust stream is introduced into the center row second from the top, so that it is completely surrounded by clear air, and the lowest dust particle starts about 12 in. above the floor. The dust is mixed with air in a vertical chamber 13 in. in diameter equipped with a 2-hp. agitator for reducing the specific gravity of small particles. The high-powered mixing is necessary to break down the flocculated clay particles.

A drawbar dynamometer, G. W. Giles (*Agr. Engin., 16 (1935), No. 6, pp. 215–217, figs. 6*).—This dynamometer, which has been developed by the Missouri Experiment Station for use in connection with studies in soil tillage, is briefly described and illustrated.

Mechanical cultivation in India, C. P. G. Wade (*Imp. Council Agr. Res. [India], Sci. Monog. 9 (1934), pp. IX+124, pls. [12]*).—A history of large-scale mechanical cultivation experiments is presented. These have related to weed control and plowing especially, and have involved the operation of several plowing projects in major agricultural regions. Descriptive information is also presented relating to different tractor and plow types and the development and adaptation of the latter.

Three appendixes give cost data on the different plowing projects, specifications for kerosene and Diesel tractors, and a special report on tractor plowing experiments.

The basin method of planting row crops and a basin lister planter, C. K. Shedd, E. V. Collins, and J. B. Davidson (*Agr. Engin., 16 (1935), No. 4, pp. 133–136, figs. 9*).—This paper is based on investigations conducted by the Iowa Experiment Station in cooperation with the U. S. D. A. Bureau of Agricultural Engineering. Its purpose is to describe the basin method of planting and the basin lister, to call attention to some of the obvious advantages of this method of planting, and to discuss briefly its probable utility.

The basin method of planting consists of placing the seed in basins formed in the surface soil. The purpose of these basins is to catch and hold rain water, thus causing it to soak into the soil near the point where it falls. In the experimental work the basins were formed and the seed planted by an experimental basin lister, which first opened a lister furrow and planted the seed, then formed transverse earth dams at regular intervals in the furrow.

The results indicate that basin planting, in conjunction with contour farming where this is desirable, reduces water erosion of the soil and lessens the danger of washing out seed or small plants. It also reduces the tendency for water to accumulate in ponds at low points and conserves moisture.

Trash shields for plows, R. H. WILEMAN (*Agr. Engin., 16 (1935), No. 7, pp. 260, 286, figs. 2*).—In a brief contribution from the Indiana Experiment Station trash shields developed for use on plows used in connection with corn borer control are briefly described and illustrated.

Machinery to control the field bindweed, C. W. SMITH (*Agr. Engin., 16 (1935), No. 4, pp. 142–148, figs. 7*).—In a contribution from the Nebraska Experiment Station data concerning the field bindweed are presented, together with technical information descriptive of machines designed for bindweed control. Some data on field experiments with these machines are presented as a basis for more intensive study, with the objective of adapting cultivator equipment to this work.

Soil sterilization by electric heat, I. P. BLAUSER (*C. R. E. A. News Letter [Chicago], No. 12 (1935), pp. 4–7, figs. 7*).—This process as developed at the Ohio Experiment Station is described and illustrated, and data from tests thereof are presented.

The resistance type of sterilizer with horizontal electrodes was found to be easier to construct and operate than other types, but has the disadvantage of low flexibility. A sterilizer that is 10 in. deep will usually bring the soil temperature up to 210° F. in from 1 to 2 hr. if the soil is moist enough to be worked easily. Data are given on the depth and area of sterilizers for different purposes.

Characteristics of the resistance type soil sterilizer, J. R. TAVERNETTI (*Agr. Engin., 16 (1935), No. 7, pp. 271–274, figs. 8*).—In a brief contribution from the California Experiment Station the resistance type soil sterilizer is described and experiments on its use reported.

It was found that the resistance type soil sterilizer has the advantages of simple and inexpensive equipment, easy and speedy operation, uniform heating, and semiautomatic operation.

Since 220 v is commonly used in these sterilizers, contact with electrodes, the soil, or wet portions of the equipment is dangerous. The box and flat sterilizers can be fairly well enclosed and equipped with safety switches, but it is difficult to prevent the equipment from becoming damp or wet.

The bench sterilizer is extremely hazardous because it cannot be enclosed and because the entire bench is charged even though only a small portion is being sterilized. The use of low voltage will assist in reducing the hazard, but may require the addition of an electrolyte to the soil in order to increase the current and reduce the heating time. In adding an electrolyte care must be taken not to obtain a concentration that will be toxic to plants.

The electrical demand of the sterilizer varies widely, depending mainly upon the electrolytes in the soil. It is also affected by distance between the electrodes, soil density, and moisture content. With one soil, the current may exceed the capacity of the electric line; with another, the current may be so low that the heating time will be excessive. Any control by varying the electrodes is difficult, because in making the sterilizer the electrodes are fixed and cannot easily be changed. Controlling the current by varying the density and moisture content is not satisfactory, for it is advisable to use a relatively high density and moisture content in order to obtain more uniformity of heating and in order to reduce the resistance of the contact between the electrodes and the soil. The best method of control over the electrical demand would be

the use of different voltages. With this method the voltage could be easily reduced when the current neared the maximum permissible.

Barrel and disk seed scarifiers, W. M. Hurst, W. R. Humphries, and R. McKee (*U. S. Dept. Agr. Circ. 345 (1935), pp. 24, figs. 6*).—Experiments are reported in which an inexpensive scarifier was devised, of barrel type, which is easy to build and suitable for farm use in scarifying small quantities of seed. River-run gravel was used as the abrasive. A farm-type concrete mixer also was used as a barrel-type scarifier, with satisfactory results.

A disk-type scarifier of larger capacity, but more costly, was designed and found to be easily operated, easily cleaned, and to cause little sprout injury. In this a stone disk was the abrasive, revolving close under a stationary disk faced with gum rubber.

Experiments were made with seed of yellow and white sweetclover, *Lespedeza sericea*, and *Crotolaria striata*, to determine the effects of these scarifiers on germination, hard seed, and sprout injury.

Best results with the barrel scarifier were obtained when the gravel was of size to pass a screen of ¾-in. mesh and be retained on a screen of ½-in. mesh, and when the volume of seed was one-half to two-thirds that of the gravel. The conclusion seems warranted that the best ratio of seed to gravel, by volume, is 1:2 to 1:1. The greater the ratio of seed to gravel, the longer the time required for scarification. The seed and gravel should fill the barrel not more than half, and the speed of rotation should be slightly less than will make some of the seed and gravel whirl with the barrel.

The capacity of the disk scarifier generally, but not always, increased with the speed of the disk and with the clearance between the disks. To maintain the germination percentage with increase in clearance, it was always necessary to increase the disk speed. Experiments as to deterioration of seed with age seemed to show that scarified seed do not remain viable as long as unscarified seed.

The design of a double-piston pressure regulator for spray pumps, K. R. Frost (*Agr. Engin., 16 (1935), No. 6, pp. 227, 228, figs. 3*).—In a contribution from the California Experiment Station studies are reported the purpose of which was to establish principles of design of pressure regulators for spray pumps. It was found that the double-piston regulator lowers the by-pass pressure and horsepower consumption of spray pumps to 50 percent of that required by the use of the standard regulator.

Mechanical equipment for grape leafhopper control, O. C. French (*Agr. Engin., 16 (1935), No. 6, pp. 213, 214, 217, 218, figs. 4*).—In a contribution from the California Experiment Station mechanical equipment in common use for grape leaf hopper control is briefly described.

The use of colored light in electrocuting traps for the control of the grape leafhopper, W. B. Herms and J. K. Ellsworth (*Agr. Engin., 16 (1935), No. 5, pp. 183–186, figs. 9*).—This is a progress report of field studies, conducted by the California Experiment Station in cooperation with the California Committee on the Relation of Electricity to Agriculture, in which the attractive capacity of colored lights was tested in connection with the use of electrocuting traps. The general set-up of the experiment is illustrated and described in detail.

The results in general indicate that a sufficient number of leaf hoppers was removed daily by one trap per acre so that the few insects remaining on the vines were of little consequence. In addition to positive control of the vine hopper, the insect electrocuters also proved of value in the control of such insects as the moths of the corn ear worm and the army worm.

The trap used consists primarily of a wire cage some 8 in. in diameter, the alternate wires being connected to the terminals of a transformer which thus supplies the voltage necessary for the electrocution of the insects.

The luminescent tube used as a lure is suspended along the axis of the wire cage to insure that the insect comes in contact with the wires as it flies toward the light. The durability and low operating cost over a period of years is dependent upon freedom from corrosion of the metal parts and the life of the luminescent tube. The electrocuting wires are of stainless steel and the luminescent tube has a proved life of more than 10 yr.

A study of power requirements and efficiency of threshing machines, E. A. Silver and G. W. McCuen (*Agr. Engin., 16 (1935), No. 4, pp. 137–141, 154, figs. 18*).—Studies conducted at the Ohio Experiment Station are reported, the purpose of which was to obtain certain facts relative to the performance of individual threshers so that the data could be studied for possible improvement of the machines relative to their power requirements and their efficiency in threshing. It was necessary, therefore, to determine the power requirements for different zones of the machine such as cylinder, rack and shoe group, blower and other units, as well as to discover the efficiency of the thresher in threshing, separating, and cleaning. Both the power requirements and efficiencies were studied simultaneously.

The power requirements of the machines were studied with (1) no load on the blower at variable rates of speed, (2) entire thresher less the blower, (3) cylinder alone, and (4) feeder. The same division of power was studied for these units when under load. The first series of tests were conducted at a rate of between 8 and 9 tons of bundles per hour, and the second series at rates varying from 5 to about 12 tons per hour. Two arrangements of concaves and grates were used, namely, (1) 1 concave and 2 grates, and (2) 2 concaves with a grate between.

It was found that for the conditions imposed there was a greater over-all efficiency performance with the concave-grate-concave combination. Considerably more power is required by the cylinder when careless feeding is practiced. Feeding the bundles heads first to the cylinder required much less power than when the bundles were alternated, or when fed butts first, this being true with both combinations of concave arrangement. Likewise the shelling efficiency was also greatly impaired by careless or irregular feeding.

A study of division of power of the thresher indicated that about 50 percent of the total power requirement was consumed in the cylinder. It also was found that the two concaves gave a higher efficiency in shelling the grain out of the heads, but as a general rule the rack and shoe efficiency dropped slightly with this arrangement.

The power requirements of all windstackers were found to be consistent. The low fan speeds were very consistent, but a spread in power requirements was noted as the speed increased. In general the no-load requirements of various machines varied very little.

Investigations on grain blowers and the basis for their design, G. Segler (*Untersuchungen an Körnergebläsen und Grundlagen für ihre Berechnung. Mannheim: Author, 1934, pp. 59, figs. 89*).—A series of technical investigations are reported in which emphasis was placed upon the relationship between air pressure and velocity in grain blowers and the injury to the germinating properties of seed grain. A large amount of data are presented and discussed. An appendix relates to the mathematical and physical technic employed in the experiments.

The harvesting and drying of crops by the tripod and other methods, J. M. TEMPLETON (*Jour. Inst. Brewing, 41 (1935), No. 5, pp. 212–218, figs. 4*).—Both natural and artificial methods of drying crops are briefly described.

Small electric driers for fruits and vegetables, A. V. KREWATCH (*C. R. E. A. News Letter [Chicago], No. 12 (1935), pp. 7–9, figs. 2*).—In a brief contribution from the Maryland Experiment Station small electric driers for fruits and vegetables developed at the station are briefly described and illustrated, and data from tests are presented.

Present practice with refrigerator cars: Outline of investigations by the United States Department of Agriculture in fruit and vegetable transport, W. V. HUKILL and D. F. FISHER (*Refrig. Engin., 30 (1935), No. 2, pp. 75–78, 104, 105, figs. 2*).—A brief outline is given of investigations being conducted by the U. S. D. A. Bureaus of Agricultural Engineering and Plant Industry.

A simple device for precooling milk, C. I. GUNNESS (*Agr. Engin., 16 (1935), No. 6, p. 218, figs. 2*).—In this device, two milk cans are placed on a platform and running water is sprayed on them through five ⅛-in. holes spaced 2 in. apart in each of two ½-in. pipes placed one on either side of each can. Tests of this device showed that it is possible to cool the milk to 70° F. for most of the year.

Preparation of feeds for cattle as it affects digestibility and absorption, E. A. SILVER (*Agr. Engin., 16 (1935), No. 7, pp. 257–259, 270, figs. 5*).—The progress results of studies conducted at the Ohio Experiment Station are reported, the purpose of which is to learn by comparable trials to what extent physiological processes involved in digestion and absorption of feeds are influenced by forage preparation, including cutting and grinding hay.

While the data are considered too meager to warrant the drawing of final conclusions, they indicate that the finer material passes out of the rumen while the coarser material remains. Chemical determinations of the material remaining indicate that the finer material which passed on contained less crude fiber in proportion to the crude protein than that being retained in the rumen. In this connection it is noted that through a 16-hr. period the whole hay ingesta is finer than either of the other preparations of hay. It was found that only a slight degree of mastication was done on the fine cut and ground hay.

A case of spontaneous combustion of hay, H. H. MUSSELMAN (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 175–182, figs. 5*).—In the instance described, the observations reported indicated that large masses of hay containing a certain amount of moisture favor the spontaneous generation of heat. Probably too the large mass retains the heat developed, which may on this account reach the danger point. The density of the mass which is increased by chopping may also restrict the circulation of air within the mass, thus favoring the retention of heat. Ventilation flues with slatted walls to favor air movement through the mass appear to be a practical means of dissipating heat which is generated even in the normal curing of hay.

As to the size of the mass or the amount of moisture permissible in the hay when stored, the study gives little information. Likewise, the amount of ventilation or spacing of ventilators, if these are to be used, can only be estimated. "The experience does, however, warrant a word of caution. Care should be taken in storing chopped hay to keep the moisture content to a reasonable limit, at least as low as that allowable in making a good quality of bright hay. When stored in large volume, ventilation of the mass also appears advisable."

Catalog of farm building and equipment plans, J. D. LONG (*Davis: Calif. Univ., 1934, pp. [101], figs. 90*).—This book has been prepared primarily to serve

as a catalog of the farm building and equipment plans available through the Agricultural Extension Division, University of California. A short description of the method of using the structure, the construction, and the approximate erection cost are given for each plan illustrated. A bibliography of other sources of farm building information and certain data sheets of general interest are included with the plan sheets.

An improved type of hogpen, S. M. M. (*Hawaii. Planters' Rec., 39 (1935), No. 2, pp. 141-143, pls. 2*).—An improved type of hogpen is illustrated. The building contains 22 pens, each 6 by 8 ft.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics and farm management by the Massachusetts Station, 1933-34] (*Massachusetts Sta. Bul. 315 (1935), pp. 5-8, 52-54*).—Included are brief statements of general or preliminary findings in studies of competitive factors influencing the supply of market milk and cream, by A. H. Lindsey and A. E. Cance; sources and uses of credit in Massachusetts, by Lindsey; the changing methods of wholesale distribution of perishable products, by L. P. Jefferson; bank service charges and national recovery policy, by R. L. Mighell and R. H. Barrett; and farm tax delinquency and farm real estate values, by Mighell.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 174 (1935), pp. 133-135*).—Included are (1) an article on The Farm Mortgage Foreclosure Situation, by H. R. Moore (pp. 133, 134), with a table showing by months, July 1933 to January 1935, inclusive, the number, acreage, judgment, valuation, and sales consideration of total sales, and the average per acre value of judgment, valuation, and sales consideration; and (2) the table by J. I. Falconer of index numbers of production, prices, and income (E. S. R., 73, p. 560) is brought down through February 1935.

[Investigations in agricultural economics by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1934], pp. 51-55*).—Included, in addition to findings on studies previously noted, are some preliminary or tentative conclusions reached in a study of dairy herd replacements and in a study of real estate transfers and tax delinquency made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the Civil Works Administration.

Relative importance of intangible property in Texas, L. P. GABBARD (*Texas Sta. Bul. 505 (1935), pp. 15, fig. 1*).—Compilations of all probated estates (25,187) in 47 selected counties for the period 1922-31 and the assessed value of property probated in these counties in 1931 are used as the basis of this study, the property in each estate being classified as real estate, chattels, and intangibles. The data are also analyzed on the basis of the size of the estate and the type of community—rural, town, and city.

Real estate constituted 50.6, chattels 3.5, and intangibles 45.9 percent of the total property probated. Of the property assessed for State and county purposes in 1931, real estate comprised 75.3, chattels 21.8, and intangibles 2.8 percent. Eighty-two percent of the estates were below the average value of the estates probated, and 80 percent of the estates represented only 20 percent of the total value. Of the total value, 53.3 percent was included in 3.5 percent of the estates. Of the 15,840 estates including intangibles, the 120 estates of $500,000 or over included 33.9 percent of the intangible property. Intangibles represented 31.6 percent of the property value probated in the rural communities (counties without a town of 5,000 population), 38.4 percent in the town communities (counties with towns of from 5,000 to 50,000

population), and 50 percent in the city communities (counties with a city of over 50,000 population). A study of a group of 7 newly developed counties and a group of 3 counties with large urban populations showed that in the former an average of 74.5 percent of the property value probated was in real estate, 12.9 percent in chattels, and 12.6 percent in intangibles, as compared with 45.6, 1.8, and 52.6 percent, respectively, in the urban counties.

The findings show that (1) intangibles almost escape taxation, (2) such property has a strong tendency to be associated with the larger estates which are presumably more able to pay taxes than smaller estates, and (3) the wealth of communities largely rural is far more vulnerable to taxation than that of communities with a high percentage of the wealth in intangibles.

1934 onion costs on 25 Michigan farms, K. T. Wright and P. F. Aylesworth (*Michigan Sta., 1935, M-129, pp. [1]+13, figs. 6; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 208-212*).—The results of the first year of a study of the costs and returns of onion production in Michigan are reported. Data are included as to onion production, prices, acreages, etc., in the United States and Michigan. A table shows the average production and marketing costs by items and other data for 25 farms studied and the 5 low-cost and 5 high-cost farms. The effects on costs and returns of yields per acre, planting date, fertilizer used, seed cost, acreage in onions, age of muck, labor cost, and labor and power cost by operations are discussed.

1934 sugar beet costs on 52 Michigan farms, K. T. Wright and P. F. Aylesworth (*Michigan Sta., 1935, M-128, pp. [1]+13, figs. 3; abs. in Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 220-224*).—This report of the results of the second year of the study on costs of sugar beet production in Michigan is based on records on 52 cooperating farms. A table shows the average production and market costs by items and other data for the 52 farms and the 10 low- and 10 high-cost farms. The effects on costs and returns of yield, acreage, time of plowing, planting date, land value, drainage, manure charge, expenditures for commercial fertilizer, row width, spacing in row, labor, power, and machinery costs, use of contract labor, and marketing costs are analyzed. A table shows the accumulated effect on yields and costs of following from one to seven good management practices. The average costs in 1934 are compared with the average costs for 45 growers in 1933.

Cost of producing pears in Washington, C. C. Hampson and E. F. Landerholm (*Washington Sta. Bul. 307 (1935), pp. 24, figs. 4*).—Analysis is made of 46 records for 1932 obtained in the Yakima and Wenatchee districts of the State. The costs, which include growing, harvesting, and hauling to shipping point or local cannery, general or overhead (interest on investment not included) and a management charge (also packing and boxes for packed pears), are shown for packed pears, cannery pears, and all pears for each district and for the 6 producers with the lowest and the 6 with the highest cost per ton for cannery and packed pears. The effects of yields on cost of production are discussed.

The average yields per acre of cannery pears were 7.8 tons in the Yakima district and 16.3 tons in th Wenatchee district. The yields of packed pears were 268 and 421 boxes per acre, respectively. The average costs per ton (box for packed pears) and per acre in the Yakima district were found to be, respectively, for packed pears 96 ct. and $259.01, cannery pears $21.22 and $164.89, and all pears $22.58 and $165.15, and in the Wenatchee district, for packed pears 83 ct. and $349.80, cannery pears $14.97 and $243.63, and all pears $18.68 and $230.04. The average per box cost for the 6 poorer orchards producing packed pears was 2.5 times that for the 6 better orchards. The average cost of production in the 6 high-cost orchards producing cannery pears was 5 times that

for the 6 low-cost orchards. The difference in cost in each case was due largely to the differences in yield per acre.

Greater differences in costs of production occurred between orchards in the same districts than between the 2 districts.

Production and price trends in the pitted red cherry industry, R. E. Marshall (*Michigan Sta. Spec. Bul. 258 (1935), pp. 26, figs. 8*).—"The major purposes of this study have been (1) to present a picture of the trends of the red pitted cherry industry, (2) to determine the causes of prices that have appeared relatively lower than those for other fruits in recent years, and (3) to point out certain implications contained in the data that should aid both producers and processors in adjusting their business to existing conditions."

The study is based chiefly on compilations of monthly pack and warehouse inventory reports. The period especially considered is 1920–34. The data are analyzed in sections on the total pack in the United States, canned cherries, trends for cold pack, rates of sales of pack in No. 10 and No. 2 cans, rates of shipping for cold pack, and price trends for canned red cherries.

The average annual pack of red cherries for 1926–34 was 69,000,000 lb. and during the last 4 yr. exceeded 75,000,000 lb. The prospective average pack for the next 5 yr. is from 85,000,000 to 90,000,000 lb. The average consumption of frozen pack increased more than 50 percent during the period of the study and is expected to average 25,000,000 lb. during the period 1935–39. For the 1931, 1932, and 1933 packs of red cherries in No. 10 cans in Michigan, New York, Wisconsin, and Ohio, only 34, 45, and 46 percent, respectively, were shipped from canners' warehouses prior to December, and price reductions were necessary to accelerate sales enough to liquidate each of the packs. Price reductions were also necessary to avoid holding considerable quantities of No. 2 cans in canners' warehouses until the succeeding fiscal year. Distribution of sales and shipments of canned cherries have been very unsatisfactory in the Eastern States for the 1931, 1932, and 1933 packs, and must be corrected by establishing opening prices and putting forth sales efforts that will move about two-thirds of the pack from the canners' hands before January. Prices of canned pitted cherries compared with other canned fruits have been low since the summer of 1931 due, in part, to the large volume of the 97,000,000-lb. pack in 1930 remaining unsold 1 yr. after the pack.

The author states "there is every indication that during the next decade red cherry production for canning or frozen pack is warranted only where production costs can be kept substantially below the average predepression prices for cherries delivered at the processing plants. Where orchards exist in which costs are higher, the producers must seek some other outlet for the fruits or go through a process of liquidation."

Marketing and distribution of certain perishable farm products in the lower Hudson Valley, W. C. Hopper and C. W. Pierce ([*New York*] *Cornell Sta. Bul. 620 (1934), pp. 37, figs. 10*).—"The purposes of this study were (1) to learn the marketing practices of fruit and vegetable growers in the lower Hudson Valley; (2) to determine the quantity of fruits and vegetables and poultry produce purchased by hotels and restaurants and the volume of these commodities handled by wholesale produce dealers and retail stores in the territory known as the lower Hudson regional market district."

Data for 1932 obtained by visits to 535 representative growers of fruits and vegetables in Ulster, Dutchess, and Orange Counties and 43 fruit and vegetable growers in Rockland County are analyzed, and tables and charts are included showing the distribution of growers by counties and main source of income, number of farms selling different commodities, the importance of fruits and

vegetables, the use of motor trucks in marketing, places at which buyers took produce, season of sale, volume of sales to different types of buyers, types of containers used, the average net prices obtained for different commodities, etc. A table shows the number of crates and net values of cauliflower, cabbage, and brussels sprouts shipped by motor truck and express by three different cooperative associations in Delaware County. Data for 1932 obtained from 129 hotels and boarding houses in the Catskill summer-resort area of Sullivan, Ulster, and Delaware Counties regarding consumption of fruits, vegetables, poultry, and eggs are analyzed, and tables show the value of commodities used, sources of supplies, and percentages of commodities grown by proprietors, grown in New York, and shipped in from other States. Data from 26 wholesale produce dealers of the lower Hudson Valley are analyzed, and tables show the value of sales, value of produce grown in New York and of that shipped in from other States, the destination of sales of fruits and vegetables, sources of supplies, etc.

The destination of Iowa's commercial oats, R. C. Bentley (*Iowa Sta. Bul. 327 (1935), pp. 337–391, figs. 14*).—This is the second bulletin in the series previously noted (E. S. R., 72, p. 119).

Tables and charts are included and discussed showing the volume and origin of Iowa's commercial oats; the relative importance of the various markets; the movement from Iowa's primary markets; the changes in market movement of first billing shipments from different areas of the State; the seasonal movement of commercial oats for the State and from different areas to various types of markets and to different types of markets from the primary markets of the State; and the destination of shipments of oats from representative counties for the 1926–27, 1927–28, and 1930–31 crops.

Commercial oats represent 26 percent of the State's production. Of the total loadings, 74 percent originate in 25 counties. The primary markets of the State receive 59 percent of the first billing shipments, Cedar Rapids taking 88 percent of the total rail shipments. Of the reshipments from the primary markets, 58 percent go to out-of-State terminal markets and 38 percent to out-of-State consuming areas. Quantity and quality of feed grain in neighboring States are the chief factors determining the direction of the commercial oat movement, especially reshipments from the primary markets of the State. Twenty-three percent of the commercial oats of the State are loaded for shipment during August, and by October 31, 45 percent have left the local shipping point. Some areas hold a larger percentage of their commercial oats until the second half of the marketing season. This practice normally yields a larger gross return and if correctly managed will show a larger net return. The southern outlet has become an increasing factor in the movement of Iowa oats, both by shipment to southern terminals and by direct movement to local feeding areas. The distribution of shipments from local shipping points is limited by railroad facilities and the demands from the neighboring territory.

Price-quality relationships in farmers' cotton markets of Texas, W. E. Paulson and J. F. Hembree (*Texas Sta. Bul. 501 (1934), pp. 35, figs. 9*).—"The main objects of this study are: (1) To ascertain the relationships between prices received by growers in the farmers' market and the quality of their cotton as expressed by grade and by staple length; (2) to compare the average price received by growers in the several local markets with the average quality of cotton in those markets; (3) to test the sensitiveness of the farmers' market to quality through a comparison of relationships between prices and quality in the local market with relationships between prices and quality revealed in 'Basis-Middling' limits."

During the seasons 1926–27 to 1932–33, inclusive, samples from 53,000 bales of cotton were obtained by the station and the U. S. Department of Agriculture in 24 farmers' markets. These were classified by cotton classers of the Department of Agriculture. Daily "spot" prices for Middling ⅞-in. cotton together with points "on" and "off" for grade and staple length were secured.

The main features of the analysis are summarized by the authors as follows:

"(1) Premiums and discounts prevailing in Basis-Middling limits used by cotton merchants in making purchases from their representatives in the farmers' markets are taken as the standard of quality recognition. Most studies of price-quality relationships in the local cotton market made hitherto have employed premiums and discounts quoted on some 'spot' market or an average of the 10 designated spot markets.

"(2) The response of price to quality in the farmers' market is ascertained independently of relations of price to quality in central and mill markets. Quality recognition in the local market is determined from paired data, which facilitate a comparison of prices paid on the same day for various grades with staple length held constant and of prices paid on the same day for various staple lengths with grade held constant.

"(3) Premiums and discounts in prices paid growers in the local market according to the various grades and staple lengths are measured in terms of premiums and discounts obtaining in the standard Basis-Middling limits as *the means of ascertaining the sensitiveness of the farmers' market to quality.*

"(4) Emphasis is placed on the local market as an integral part of the marketing system. Comparisons are made as to: (a) Relationships between average quality and average price paid growers in the various farmers' markets; (b) movement of 'basis' during the progress of the marketing season in the local markets and in the central market; (c) movement of prices in the local market according as prices in the futures market rise or fall."

Some of the findings were as follows: Growers on an average received 20 percent of the premiums for grades above and were assessed 31 percent of the discounts for grades below Middling recognized in the Basis-Middling limits used by merchants in buying cotton from their representatives in the local markets. In the case of staple lengths, growers received an average of 6 percent of the premiums for staple lengths above and were assessed 10 percent of the discounts for those below ⅞ in. prevailing in Basis-Middling limits. In the markets where local cotton buyers predominated growers received on an average 29 percent of the premiums for grade and 8 percent of the premiums for staple length and were assessed 41 and 4 percent, respectively. In the markets where supply merchants and ginner buyers were predominant, 16 and 6 percent, respectively, of the premiums were received and 25 and 10 percent, respectively, of the discounts were assessed.

Prices in the farmers' market were found to respond from day to day to price changes in the futures market. During the period of the study a rise of 20 points in the futures market was followed by about a 12-point rise in the local markets, and a fall of 20 points in the futures markets by a fall of about 22 points in the local markets. With the effects of location removed, price levels in the various farmers' markets are determined largely by the average quality of cotton offered for sale in the respective markets. Average prices in the local markets are influenced by the reputation of the markets as to the quality of their cotton. Staple length is relatively of greater importance than grade in establishing differences in price levels between farmers' markets. In general, an improvement in the average quality of cotton was accompanied by an increase in the average price to growers.

"The average quality, under the marketing system now in vogue, directly influences the price of specific qualities. To the extent that the average quality in a farmers' market declines with the advance of the marketing season, a grower in the early part of the season with a bale of cotton of quality higher than the average electing to sell later in the season will suffer a loss approximately equivalent to the amount of the decline in average quality. . . .

"The bargaining position of the grower in the farmers' market is weakened by a general inability to grade and staple his cotton and to translate the various price indicators into the local situation.

"The explanation for the situation now existing in the farmers' market must be sought in the various ramifications of 'point buying.' Under this system, the buyer has in mind a general average price which will enable him to offset losses on the lower qualities purchased by gains on the higher qualities."

Foremost among things needed in the farmers' markets to improve price-quality relationships are: "(1) Official classification of cotton by an employee of the United States Department of Agriculture prior to sale by the grower; (2) expansion of the official market news service of the United States Department of Agriculture to include price quotations for cotton under Basis-Middling conditions as well as in 'even-running' lots; (3) fuller collection and wider dissemination relative to varieties of cotton being planted in the various soil areas and their adaptability to such areas."

St. Louis milk problems, with suggested solutions, R. W. Bartlett (*Illinois Sta. Bul. 412 (1935), pp. 89–184, figs. 35*).—This report is based on data gathered in a study made in cooperation with the St. Louis Milk Market Administration. The data are analyzed and discussed in sections on Present Milk Consumption in St. Louis (pp. 94–99); Causes of Low Milk Consumption in St. Louis (pp. 99–110); How St. Louis Milk Sales Might be Increased (pp. 110–116); Why Prices to Producers Declined from 1929 to 1933 (pp. 117–124); The Basic-Surplus Price Plan (pp. 125–131); Distributors' Gross Handling Margins (pp. 131–135); St. Louis Milk Market Organizations: Aims and Accomplishments (pp. 135–143); and Present Policies Under the Federal Milk License (pp. 143–157). Some of the findings were as follows:

The present average daily consumption per capita of milk in the St. Louis area is 0.42 pt., being the lowest in any of the 14 largest cities in the United States. Increased consumption would benefit producers, distributors, and consumers. The low level of consumers' incomes coupled with relatively high prices for milk and extremely high summer temperatures combined with lack of refrigeration are major causes of low consumption. The policy of maintaining store prices of milk equal to or not more than 1 ct. per quart below retail delivery prices has tended to discourage store sales. The basic-surplus price plan adopted in the St. Louis milkshed in 1930 does not appear to have been the cause of the declining prices paid producers during 1929–33. An upward movement in prices paid producers may be expected within the next few years, due to the probable increases in the general price level and in consumers' incomes and to the prospective decline in milk production in the country as a whole as a result of advancing feed prices and fewer cows.

Some of the recommendations made are that to increase per capita consumption (1) milk should be sold through stores with adequate refrigeration at prices enough below retail delivery prices to give consumers full benefit of a lower distribution cost, and (2) the educational program of the Dairy Commission of St. Louis should be expanded. Hauling routes from farms to

milk plants should be gradually rearranged to reduce excessive costs from the duplication and overlapping of routes. Producers should continue to adjust their feeding and breeding practices to bring about a more even production of milk throughout the year. Specific regulations should be made as to conditions under which milk can be produced for manufacturing purposes and for the fluid-milk market. More efficient production practices should be encouraged.

"The principal functions of the Agricultural Adjustment Administration and the Milk Market Administration in the fluid-milk industry are economically sound and should be continued by some agency, Federal or other. The services of the Federal Government in the St. Louis market would be materially strengthened if provision were made in the license for reestablishing price conferences between producers, distributors, and consumers. Research studies of important problems confronting producers, distributors, and consumers of milk should be continued in order to furnish a factual basis for determining policies that will be mutually beneficial."

Crops and Markets, [May–June 1935] (*U. S. Dept. Agr., Crops and Markets, 12 (1935), Nos. 5, pp. 145–184, figs. 3; 6, pp. 185–224, figs. 3*).—Included in both numbers are tables, charts, reports, summaries, etc., of the usual forms covering crop and livestock estimates, market reports, and the price situation. No. 5 also includes a table showing the estimated value per acre of farm real estate, in terms of pre-war average value, by States, March 1, 1935, with comparisons of the years 1920, 1925, and 1930–34, and an article on Farm Population, January 1935 (pp. 182, 183).

RURAL SOCIOLOGY

Part-time farming in Connecticut.—A preliminary survey, I. G. Davis and L. A. Salter, Jr. (*[Connecticut] Storrs Sta. Bul. 201 (1935), pp. 47, figs. 11*).—This study is based on historical data from various sources, data for 1,115 part-time farmers in 12 towns in the Eastern Connecticut Highland gathered in the study previously noted (E. S. R. 71, p. 265), similar data for 2,934 part-time farms in 31 towns in other parts of the State gathered in 1934, and data for 1,779 part-time farms gathered in 36 towns in cooperation with the Division of Subsistence Homesteads, U. S. Department of the Interior. The data are analyzed and discussed in sections on historical background of, the extent and relative importance of, geographical distribution of, agricultural description of, social characteristics of, and financial description of part-time farming.

Over 20,000 of the more than 30,000 farms in Connecticut are operated on a part-time basis. The present pattern of such farming is largely the outgrowth of the traditional organization of the rural life of Connecticut. The greatest density of part-time farms per square mile is in the areas of urban and industrial development. Other things being equal, the total number of farms per square mile is greater and the percentage of farms in part-time use lower on the better soils. The agricultural enterprises of part-time farms tend to be considerably larger in the remote and more rural areas. The outside labor in which part-time farmers engage is somewhat but not highly related to locality. Forty percent of the present part-time farmers were found to be retired or unemployed and 20 percent to be craftsmen or factory operatives. Although part-time farmers comprised two-thirds of the farmers of the State and utilized 35 percent of all the farm land, they sold less than

3 percent of all products marketed by farmers. The average value of part-time farms ranged from less than $3,000 to over $6,000 in different counties. Part-time families with outside labor in 1933 averaged $738 in wages and $243 in value of food and fuel produced. On an average, dairy and poultry products are the most valuable contributions part-time farms make to family income and sustenance.

Mobility of rural families.—II, Changes in residence and in occupation of sons and daughters in rural families in Genesee County, New York, W. A. Anderson (*[New York] Cornell Sta. Bul. 623 (1935), pp. 37, figs. 6*).—This study includes 7,381 living children who were members of 2,539 open-country families in Genesee County (E. S. R., 72, p. 128), showing that 2,330, or 32 percent, had permanently left the parental home to establish their own homes or live by themselves. This included 119 daughters to every 100 sons. The movement away begins about the time the children are 16 yr. of age and is practically completed by the age of 30.

The school training of these children who have left comprises 8 yr. of grade school and 2 yr. of high school. This is 2 yr. more of schooling, on the average, than their parents received. The daughters have an average of ½ yr. more of schooling than the sons. Of the sons away from home, 10 percent, and of the daughters, 13 percent, are college graduates, as compared with 3 percent of the fathers and mothers who are college graduates.

Apparently there is a slight tendency for the better-schooled sons and daughters to settle in the city centers rather than in the open country or smaller villages. This is especially true of the college-trained. Twice as many settle in cities as in villages or in the open country.

The proportion of sons and daughters who are away from home is lowest in rural families where the parents are foreign-born and highest where parentage is mixed.

Cities of more than 2,500 population employ one-half of these sons and daughters, the open country 30 percent, and villages of 50 to 2,500 inhabitants, 20 percent. The married sons and daughters settle nearer the parental home than do those unmarried.

Farming as an occupation employed 23 percent of the sons living away from home, either as owner-operators or as tenants. An additional 7 percent were farm laborers. Of the daughters, 23 percent were wives of farmers and 1.8 percent were housekeepers on farms.

Seventy percent of the sons in occupations other than farming included 20 percent skilled workers, 27 percent unskilled workers, 8 percent business managers, 4 percent clerks, 2 percent in professions, and 4 percent in school (2 percent in college). Of the daughters away from home, 69 percent were housewives, 23 percent on farms, and 46 percent in villages and cities. Other occupations in which they engaged were housekeeping, clerical and stenographic work, unskilled labor, school teaching, and professional activities.

Though farming does not employ all the children produced by the farming class, it is more likely to be handed down from parents to children than are most other major occupations. As a result,, it is carried forward by the same type of population, with only slight geographic shifting. This gives the rural areas a continuing stable social organization.

FOODS—HUMAN NUTRITION

Tribute of science to the Royal Jubilee (*Nature [London], 135 (1935), No. 3418, pp. 669–768, figs. 6*).—Among the collection of articles reviewing progress in various scientific fields during the 25 yr. of the reign of King George V,

the following are of particular interest in this section: Discovery and Significance of Vitamins, by F. G. Hopkins (pp. 708–712); Structure and Physiological Activity, by J. Pryde (pp. 713–716); Diet and Disease, by S. J. Cowell (pp. 716–718); and Food Storage and Transport, by F. Kidd (pp. 739–741).

Beryllium rickets.—II, The prevention and cure of beryllium rickets, H. D. Kay and D. I. Skill (*Biochem. Jour., 28 (1934), No. 4, pp. 1222–1227, fig. 1*).—In this continuation of the investigation noted previously (E. S. R., 70, p. 891), evidence is presented indicating that "beryllium rickets, which invariably results when young rats are given the normal stock diet to which 0.5 percent of beryllium carbonate has been added, can be prevented if at the same time that the beryllium is being fed a relatively small daily quantity of sodium glycerophosphate is administered parenterally. This adds further support to the view that beryllium rickets is mainly or possibly entirely due to defect of absorption of phosphate from the gut. If animals with beryllium rickets are put on to a normal diet without beryllium, they recover very rapidly. One of the first changes to be observed is an increase in the phosphoric ester content of the erythrocytes and of the liver."

[Food utilization studies at the Massachusetts Station], W. W. Chenoweth et al. (*Massachusetts Sta. Bul. 315 (1935), pp. 60, 61*).—This progress report (E. S. R., 71, p. 557) includes summaries of further studies, in addition to those previously noted from complete reports, on the vitamin C content of tomato juice and blueberries and of nutritive and technological studies on canned Atlantic whiting, fishmeal, and mackerel oil, research on home canning methods, and preliminary studies on the microbiology of dehydrated prunes and grapes.

[Studies in foods and nutrition] (*Nebraska Sta. Rpt. [1934], pp. 16, 17*).—Brief progress reports are given on studies of the cooking quality of navy and Great Northern beans and the use of lard in cake making.

A dinner demonstration of threshold differences in taste and smell, A. F. Blakeslee (*Science, 81 (1935), No. 2108, pp. 504–507*).—This description of a demonstration of wide differences in the reaction of various people to taste and smell tests affords suggestions for testing the relative sensitiveness of individuals serving as judges in food palatability tests.

The specific dynamic action of food, C. M. Wilhelmj (*Physiol. Rev., 15 (1935), No. 2, pp. 202–220*).—This review makes no attempt to cover the historical development of the subject or earlier theories, but "aims to present briefly the present status of the problem and particularly to emphasize certain newer concepts and experimental evidence which are causing rapid changes in contemporary theories."

The review deals chiefly with problems concerning the specific dynamic action of proteins and amino acids, but a few pages are given to the specific dynamic action of glucose and carbohydrate. It is noted that there has been no new material pertaining to the specific dynamic action of fat, although certain unpublished experiments indicate that there is frequently a marked discrepancy between the specific action of fat and the behavior of the respiratory quotient.

A list of 83 references to the literature is appended.

The appetite stimulating and growth promoting property of liver, D. W. Johnson and L. S. Palmer (*Jour. Nutr., 8 (1934), No. 3, pp. 285–294*).—In this investigation at the Minnesota Experiment Station, fresh pork liver when fed to rats as a 0.5-g daily supplement to a purified diet ad libitum, increased food consumption and growth of the animals as compared with controls on the basal diet alone. When the paired-feeding method was used, however, the rats receiv-

ing the liver supplement grew no faster than the controls. Liver meal, when fed in amounts equivalent to the fresh liver, increased growth rate to a less extent, and beef muscle meal, although more appetizing than the liver meal, did not increase growth.

In a second series of experiments, the appetizing properties of pork, beef, and calf liver were tested by feeding the materials at a 0.5-g daily level to rats receiving a basal diet ad libitum. All three types of liver had a favorable effect upon growth and food consumption. When the paired-feeding method was used with beef liver, the animals receiving the liver grew at the same rate as the controls. Male rats showed a greater growth response to fresh liver supplements than female.

The authors suggest the use of the term appetite factor rather than growth factor for the substance responsible for the effects noted.

Practical fish cookery, A. I. Webster and W. T. Conn (*U. S. Dept. Com., Bur. Fisheries, Fishery Circ. 19 (1935), pp. II+26*).—Information is given on the food value of fish and shellfish, factors to be considered in purchasing for economy, the different varieties classified as lean and fat, with suitable methods of cooking, and the season of greatest abundance. General cooking directions are given, with special recipes for carp, oysters, shrimp, crabs, clams, lobsters, scallops, and salted or smoked fish and for fish sauces.

A study of the effect of the addition of sodium chloride to the cooking water upon the loss of calcium of vegetables, R. Jordan (*Jour. Home Econ., 27 (1935), No. 6, pp. 376–382*).—In this contribution from the Indiana Experiment Station, data are reported on the calcium content of from 2 to 6 samples each of asparagus, green beans, cabbage, carrots, peas, potatoes, and turnips in (1) the raw state, (2) cooked in distilled water, and (3) cooked in distilled water to which chemically pure sodium chloride had been added. The preparation of the vegetables, the proportion of salt to water, and the length of time of cooking correspond to recommended household practice.

The losses of calcium in the vegetables cooked in unsalted water ranged from 0.8 percent for one sample of green beans to 37.8 percent for one of potatoes, with an average of 19.9 percent for all of the vegetables tested. In the salted water the losses ranged from 3.9 percent for one sample of potatoes to 46.3 percent for one of cabbage, with an average for all of 19.44 percent. The differences in losses between the same vegetables cooked in the two ways were in many cases much less than differences between the various samples of the same vegetable in the raw or cooked state. Statistical treatment of the data showed significant differences in losses only in the case of one lot of cabbage, two of peas, two of potatoes, and one of turnips.

It is thought that until more extensive data are obtained, no conclusions can be drawn as to the general effect of salt in the cooking water upon the losses of calcium in vegetables.

A list of 34 references to the literature is appended.

The iodine content of some Georgia vegetables and water as a factor in its variation, K. T. Holley, T. A. Pickett, and W. L. Brown (*Georgia Sta. Bul. 190 (1935), pp. 11, fig. 1*).—Analyses of 109 samples of locally grown potatoes showed "a very low iodine content, with no apparent variation in samples from different soil types. The leafy vegetables examined [turnip tops, lettuce, collards, pimientos, and spinach] showed a fair content of iodine.

"Evidence is presented which indicates that the iodine uptake by at least three vegetables tends to increase with an increasing water supply for the growing crop, and that the water factor alone may account for great variations in the quantities of iodine found in crops grown under conditions that are similar

in other respects. It is suggested that water supply is only one of the factors which may have great influence on the iodine content of a crop and which may cause seasonal variations."

The iodine content of potatoes, J. F. McClendon, E. Barrett, and T. Canniff (*Biochem. Jour., 28 (1934), No. 4, pp. 1209–1211, figs. 2*).—This paper is devoted chiefly to a discussion of technics for ashing food samples for iodine determinations, with the conclusion that there seems to be no way of preventing losses in ashing, although these losses are greater for open ashing in an electric furnace than in the special combustion tube devised by the senior author. It is suggested that after a technic has been developed whereby the losses are comparable it is possible by averaging a large number of determinations to tell whether the iodine content of food samples from one region is higher or lower than from another.

As an illustration, data are reported on the iodine content of potatoes from different parts of Minnesota on the basis of analyses by the same person of 55 samples, some being from the eastern and the rest from the western section of the State. The average values were 85γ per kilogram for the eastern and 220γ per kilogram for the western section. It is noted that the number of cases of simple goiter per thousand drafted men during the World War was 19 for the eastern section and 7.5 for the western section of the State, thus indicating an inverse relation between the iodine content of potatoes and goiter in the drafted men.

Cooking American varieties of rice, M. C. Stienbarger (*U. S. Dept. Agr. Leaflet 112 (1935), pp. 8, figs. 2*).—This leaflet describes the different varieties of rice grown in the United States, with satisfactory cooking time for each, and the forms in which rice appears on the market, with U. S. standard grades for white and brown rice, discusses the food value of rice and its byproducts, and gives recipes suggestive of the many ways to serve rice alone or in combinations with meat, fish, milk, cheese, eggs, vegetables, and fruits.

The native fruits of North Dakota and their use, A. F. Yeager, E. Latzke, and D. Berrigan (*North Dakota Sta. Bul. 281 (1935), pp. 26, figs. 15*).—This bulletin contains both technical and practical information on the common wild fruits of the State. The fruits are listed with botanical classification. General directions are given for making fruit sauces, preserves, jams, and jellies. The individual fruits are discussed from the standpoint of distribution, description, and methods of utilization, with, in most cases, photographs and suggested recipes.

The chemical composition of the loquat (*Eriobotrya japonica*), C. G. Church and D. G. Sorber (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1935), No. 11, pp. 335–340, figs. 3*).—Data presented on the composition of the Champagne, Advance, and Thales varieties of loquat show 10.13, 9.11, and 8.49 percent of total sugars, respectively, consisting roughly of two-thirds reducing sugars and one-third sucrose. The edible portions of the fruit were 73.3, 70.8, and 74.7 percent.

Methods of retarding the rate of darkening of cut bananas, M. De G. Bryan and E. Plotz (*Jour. Home Econ., 27 (1935), No. 2, pp. 96–98*).—A solution containing cream of tartar to preserve the color and Karo sirup or cerelose to preserve the firmness has been found to keep sliced bananas light in color and firm in texture for several hours without affecting the original flavor of the fruit. Directions are given for preparing the solution.

Nutritive value of dried fruits, A. F. Morgan (*Amer. Jour. Pub. Health, 25 (1935), No. 3, pp. 328–335, figs. 5*).—Brief summaries are given of the significant findings in a series of studies, many of them noted previously from other

sources, of the effect of various methods of drying on the content of vitamins A, B_1, and C in peaches, prunes, apricots, and Thompson seedless grapes, with incomplete data on vitamin G. Practical advice to the producer, and indirectly to the consumer, is given as follows:

"Peaches and apricots should be dehydrated and sulfured to retain their excellent natural content of vitamins A and C, even though their small B content be largely lost. Raisins should not be sulfured, but should be lye-dipped and dehydrated to preserve their good vitamin B and A content, and should not be counted on for vitamin C. Prunes should be lye-dipped, not sulfured, and dehydrated also, since their natural endowment is similar to that of raisins. Figs which are not rich in either A or C should be unsulfured and either dehydrated or sun-dried. The black Mission figs, however, contain enough vitamin A to merit dehydration."

A new problem in fruit preservation.—Studies on Byssochlamys fulva and its effect on the tissues of processed fruit, M. Olliver and T. Rendle (*Jour. Soc. Chem. Indus., Trans., 53 (1934), No. 22, pp. 166T–172T*).—Troublesome cases observed in England of the disintegration of processed fruit without production of gas have been traced to a new species of fungus, which has been described under the name *B. fulva*. The fungus is said to be of widespread occurrence in England, having been detected in fruits grown and packed in various parts of the country, but to be apparently unknown in America. Inasmuch as the fungus presents a problem of considerable importance in food preservation where it may occur, information is presented on its morphology, identification, and growth on natural and synthetic media, the nature of the disintegration of infected fruit, the growth of the fungus on fruits, main sources of infection, and environmental factors favorable to its growth.

The initial source of contamination has been traced to orchards and fields. The ascospores have been found capable of resisting a temperature of from 86° to 88° C. for 30 min. in many fruit sirups. The softening of the fruit is attributed to pectin decomposition.

Home canning and public health, F. W. Tanner (*Amer. Jour. Pub. Health, 25 (1935), No. 3, pp. 301–313, figs. 2*).—This paper covers much the same ground as one previously noted (E. S. R., 72, p. 809), the general theme being the responsibility of organizations disseminating advice to home canners to insist upon pressure-cooker methods of processing nonacid vegetables and meats. A table similar to the one in the previous paper, summarizing the methods of processing recommended by various State extension services, is given of the recommendations of manufacturers of supplies for home canning, editors of cookbooks, and various magazines and newspapers. Tabulated data are also given on the reported botulism outbreaks, with incriminating foods, for the years 1929–33.

Attention is called to precautions that must be taken even with a pressure cooker to insure a sterile product.

Degree of constancy in human basal metabolism, F. G. Benedict (*Amer. Jour. Physiol., 110 (1935), No. 3, pp. 521–530*).—Data are reported on the metabolism of the author measured under basal conditions with the helmet respiration apparatus on both the closed- and open-circuit principles on 18 consecutive days (except Sundays) in May 1932 and on 33 consecutive days in May and June 1933.

All of the measurements, including insensible perspiration, were extraordinarily uniform from day to day and were not affected by "variations in the length and depth of sleep, the normal fluctuations in room temperature, or rather considerable variations in the character and amount of the meal the

evening before. The ingestion of a fairly carbohydrate-rich meal at noon resulted in a somewhat higher respiratory quotient the next morning, but did not alter the oxygen consumption. The insensible perspiration was closely correlated with the basal heat production. An emotional disturbance caused a marked increase in metabolism, which did not subside for several days."

Maintenance nutrition in the pigeon and its relation to heart block, C. W. Carter (*Biochem. Jour., 28 (1934), No. 3, pp. 933–939, fig. 1*).—Further studies on the nature of the curative factor for heart block in pigeons on a polished rice diet (E. S. R., 65, p. 596) are reported and summarized as follows:

"The experiments outlined in this paper provide evidence for the view that one factor limiting the restoration, after depletion, of full weight of pigeons on a diet of polished rice supplemented by a yeast concentrate is an inadequate allowance of protein in the diet. Where this partial deficiency is made good by the addition of caseinogen, full restoration of weight usually occurs. It is not finally proved that caseinogen, purified in the manner described, provides no factor other than protein, and it would, therefore, be premature to draw conclusions from these experiments as to the necessity for vitamin B_4 in pigeon nutrition. The evidence does, however, indicate that maintenance of, or recovery to, full weight may be compatible with the persistence of a cardiac arhythmia of dietary origin. This dietary constituent can be extracted from wheat germ, and its administration in amounts equivalent to 6–8 g leads to complete restoration of function."

Studies in metabolism during pregnancy, C. M. Coons (*Oklahoma Sta. Bul. 223 (1935), pp. 113, figs. 9*).—This is the complete report of the investigation of the author, with the assistance of A. T. Schiefelbusch, G. B. Marshall, and R. R. Coons, on the nutritional needs of human pregnancy. Reports of different phases of the investigation as published in various scientific journals have been noted (E. S. R., 72, p. 721).

The literature on the chemical analysis of the human fetus and on balance experiments during pregnancy is first reviewed, the experimental procedures for the collection of samples and for the chemical analyses are described, and other experimental conditions are discussed. Each of the factors studied, including calcium, phosphorus, magnesium, sulfur, chlorine, acid-base balance, water balance, iron, utilization of the minerals of the diet, nitrogen, and self-selected dietaries of women during pregnancy, is discussed, with the background of previous work as reported in the literature, the findings in the present investigation, and the conclusions drawn from all available reports. Results of unusual interest are discussed in relation to clinical problems and to obstacles complicating the formulation of dietary standards for pregnancy, and problems urgently in need of solution are pointed out. Chief among these are factors influencing the metabolism of sulfur and iron during pregnancy. Over half of the sulfur balances were negative, and about three-fourths of the iron balances, while not negative, were too low to meet the estimated fetal needs.

A list of 250 references to the literature is appended.

Metabolism in children during muscular work.—I, The effect of racing on the urinary constituents in boys, I. Nakagawa and K. Kawamo (*Amer. Jour. Diseases Children, 49 (1935), No. 3, pp. 594–602, figs. 4*).—In this study, conducted in Japan on Japanese subjects, analyses were made of the urine of 37 boys from 7 to 13 yr. of age before and after taking part in short distance (40, 60, or 135 m) or long distance (1,200 m) races at an athletic contest. Similar data are also reported, with samples taken at more frequent

intervals over a longer period, for 7 boys 11–12 yr., 2 boys 12 yr., and 3 men 21–24 yr. of age running a 1,200-m race.

After the short distance races no significant changes were noted in any of the urinary constituents studied. After the long distance race albuminuria was present in many cases, the acidity of the urine increased, and the total nitrogen decreased during the period from 30 to 60 min. after the exercise and then gradually rose to normal.

A study of anorexia in preschool children, A. L. Daniels and G. Everson (*Jour. Home Econ., 27 (1935), No. 1, pp. 43–49*).—This study was suggested by the observation that in a group of 14 children of preschool age who had lived under controlled conditions for 32 periods of 16 days each without showing any signs of anorexia, modification of the diet by including more cereal foods was followed by a lengthening of the time spent in eating, a sign of lack of appetite. To determine the factors involved, 11 children of preschool age during periods of 8 and 16 days each were given four types of adequate and calorically comparable diets containing the same relative amounts of fat, carbohydrate, and protein, but differing in the amounts of cereal foods and milk. The children were kept under as nearly as possible identical conditions and their physical well-being was checked daily.

Records were kept of the time spent in eating each meal, which ranged from 45 min. a day for a low cereal diet with a pint of milk to 150 minutes for a high cereal diet with a pint of milk. At breakfast an average of 40 min. was taken by the children on the high cereal, as compared with 19 min. by those on the low cereal diet. The time spent by several individual children on the low and high cereal diets with a pint of milk was 52 and 91, 47 and 75, 88 and 116, and 101 and 150 min., respectively. Very little difference was shown in the time spent in consuming diets of low and high milk content.

The differences in time spent in eating are attributed largely to variations in food bulk, for the more bulky meals were those containing the larger proportion of cereal foods. It is thought that a diet bulky with cereals may satisfy a child's desire to eat before he has obtained all the elements he needs for growth and activity.

Height-weight-age measurements of Chinese girls, W. E. Waters and C. C. Dozier (*Jour. Home Econ., 27 (1935), No. 6, pp. 362, 363*).—Age, height, and weight data are reported for 38 exceptionally well cared for Chinese children from 5 to 18 yr. of age, either Cantonese by birth or first generation American Chinese of Cantonese parentage. Fifteen of the 38 were above the average weight for American children according to the Baldwin-Wood standards and only 1 as much as 10 percent underweight.

The data are considered of significance in view of the general belief that the average Chinese child is smaller than the American child of the same age and height and also that the Cantonese are smaller than the Chinese of any other district. Optimal nutrition is thought to be responsible for the condition of the children in the present study.

The use of milk, fruit, and vegetables in the diet of rural Rhode Island school children (*Rhode Island Sta. Rpt. [1934], p. 77*).—This is a preliminary report of the analysis for calories and minerals of the records of consumption of milk, fruits, and vegetables during one week by 175 school children in different parts of the State.

The use of banana sugar as the carbohydrate in milk mixtures for well babies, N. O. Pearce (*Arch. Ped., 52 (1935), No. 5, pp. 292–301*).—The term banana sugar is used in this report for dehydrated ripe bananas. Data are

given on the composition of the product, including the percentages of individual carbohydrates and ash constituents and units per ounce of vitamins A, B, and C. The value of the product for modifying various types of milk mixtures for infant feeding is demonstrated by case reports for several groups of infants of various ages and in different circumstances.

Calcifying factors in the diet of salamander larvae, E. M. PATCH (*Science, 81 (1935), No. 2107, p. 494*).—The use of salamander larvae as test agents for the biological assay of calcifying materials is suggested because of the demonstrated sensitivity of their response to variations in calcifying factors as shown by X-ray studies. A few feeding experiments are reported in illustration of the fact that salamander larvae are similar to higher animal forms in their response to calcifying factors in the diet.

Relation of calcium to blood formation, J. M. ORTEN, A. H. SMITH, and L. B. MENDEL (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1093–1095*).—In this preliminary report, data are presented leading to the conclusion that the presence of calcium in a diet previously shown to be extremely low in calcium, sodium, and chlorine and deficient in potassium, magnesium, phosphorus, and possibly iron both cured and prevented the development of the expected polycythemia and concomitant chronic anemia. The possibility is suggested that the beneficial action of calcium on the hemoglobin level may depend on a favorable effect of this element on the economy of iron in its metabolism. The data are considered of significance in that they show that "the calcium-supplemented animals, although still consuming a ration extremely deficient in sodium and chlorine, and to a lesser degree potassium, magnesium, and phosphorus, maintain a normal blood picture and, as far as can be determined by gross observations, are entirely normal."

Contribution to the study of the rachitogenic action of cereals.—The calcium and phosphorus liberated by the digestion of cereals in vitro, with or without NaCl [trans. title], G. POPOVICIU, G. BENETATO, and R. OPREAN (*Compt. Rend. Soc. Biol. [Paris], 119 (1935), No. 19, pp. 445–447*).—In vitro digestion of corn, wheat, and barley flour with pancreatic ferments and enterokinase at pH 8.4 resulted in the liberation of small quantities of calcium and phosphorus, corn furnishing the smallest amount. Sodium chloride in 20 percent concentration increased the proportion of calcium thus liberated. This is thought to explain the observation of various workers that the rachitogenic action of cereals can be combated to a certain extent by an excess of NaCl in the diet.

Results of the ingestion of cod liver oil and yeast on calcium and phosphorus metabolism of women, H. A. HUNSCHER, E. DONELSON, B. N. ERICKSON, and I. G. MACY (*Jour. Nutr., 8 (1934), No. 3, pp. 341–346*).—No consistent changes were noted in the retentions of calcium and phosphorus by three healthy women subjects as a result of the addition to their diet of 15 g of cod-liver oil alone or supplemented with 10 g of yeast daily.

The calcium and phosphorus metabolism of children with mottled enamel, E. M. LANTZ, M. C. SMITH, and R. M. LEVERTON (*Jour. Home Econ., 27 (1935), No. 4, pp. 236–239*).—A comparison is reported of the calcium and phosphorus retentions of 4 girls who were among the subjects of an earlier study of the calcium and phosphorus content of the diet of a group of children in an Arizona community afflicted with mottled enamel (E. S. R., 68, p. 870) and of 4 girls of the same age with normal teeth. The diets of the two groups were the same, the only difference being the fluorine content of the water, which was 4.5 p. p. m. for the former and negligible for the latter.

"No consistent or significant differences in the retentions of calcium and phosphorus in the two groups of girls were observed. It can be concluded, therefore, that fluorine in amount sufficient to produce a severe type of mottled enamel of the teeth does not cause any great disturbance in the body's ability to metabolize calcium or phosphorus. A specific effect of fluorine upon the enamel-forming organ is a more probable explanation of the action of fluorine in the production of mottled enamel."

Fluorine toxicosis, a public health problem, M. C. Smith (*Amer. Jour. Pub. Health, 25 (1935), No. 6, pp. 696–702, figs. 5*).—This contribution from the Arizona Experiment Station consists largely of a summary of the extensive studies of the author and her associates on mottled enamel and other harmful effects of fluorine. Special emphasis is given to the low human tolerance level for fluorine and to the danger of increased prevalence of mottled enamel in all sections of the country as a result of the growing use of fluorine compounds as insecticide sprays.

Manganese: Its distribution, pharmacology, and health hazards, W. F. von Oettingen (*Physiol. Rev., 15 (1935), No. 2, pp. 175–201*).—This extensive review of the literature is presented under the headings distribution and occurrence of manganese in plants, effect on tissue activity in animals, occurrence in animal tissues, absorption from the intestinal tract, excretion, distribution in the body after administration, pharmacological effect on the blood, effect on growth, autopsy findings in animals treated with manganese, industrial manganese poisoning, toxicity, and therapeutic use of manganese compounds.

The general conclusions drawn as to the significance of manganese in normal nutrition are that it is a regular constituent of, and has important metabolic functions in, both plant and animal tissues. In animals it is absorbed slowly and incompletely from the intestinal tract, is stored mainly in the liver and kidneys, and is excreted chiefly in the feces, but partly with the bile and to a moderate extent in the urine. Manganese appears to stimulate growth in young animals and when administered is toxic only in large doses, which lead to gastric disturbances. The toxicity varies with different salts. An extensive list of literature references is appended.

The copper content of blood, S. L. Tompsett (*Biochem. Jour., 28 (1934), No. 4, pp. 1544–1549*).—As determined by the McFarlane method (E. S. R., 70, p. 12), with slight modifications, on blood from which the proteins had been precipitated with trichloroacetic acid, normal human blood has been found to contain from 0.185 to 0.229 mg of copper per 100 cc, more or less equally distributed between plasma and corpuscles. Values of the same order were obtained for the copper content of sheep, ox, pig, horse, and guinea pig blood. Rabbit blood had slightly lower values.

The hydrogen ion concentration of the contents of the small intestine, C. S. Robinson (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 403–408, fig. 1*).—The mechansim by means of which the H-ion concentration of the intestinal contents of various animals studied decreases from the pylorus to the ileocecal valve (E. S. R., 66, p. 489) has been demonstrated in rats by ligating portions of the intestines after filling them with saline solution, and testing the contents for pH after suitable periods of time.

The earlier findings of increased alkalinity from the upper to the lower portions of the bowel were confirmed. As the same results were obtained in the present work with simple salt solutions as in the earlier with food residues, it is concluded that the intestinal wall itself is the seat of the force controlling the reaction.

It is pointed out that it is possible to attach too much importance to the reaction of a mixed sample of intestinal contents because only the portion of such contents in actual contact with the intestinal wall is of immediate physiological importance. "It has been suggested that the intestinal wall takes an active part in the final processes of digestion, e. g., in supplying erepsin for the last stage of protein breakdown. It may also, as a part of this function, maintain at the actual site of absorption an optimum reaction for the processes necessary for preparing various food constituents for entrance into the body."

Urinary excretion of citric acid, I, II, C. SCHUCK (*Jour. Nutr., 7 (1934), No. 6, pp. 679–689, 691–700*).—Two papers are presented.

I. *Effect of ingestion of large amounts of orange juice and grape juice.*—The effect of large amounts (1,000 cc daily) of orange juice or grape juice on the urinary excretion of citric acid and on the urinary pH, titratable acidity, and excretion of total organic acids was studied in two series of experiments, with four young women serving as subjects in each. In the first series orange juice was taken by all of the subjects, and in the second orange juice by two and grape juice by two.

In all cases the pH of the urine and the organic acids were increased and the titratable acidity was decreased. The excretion of citric acid was increased, the actual increase being slightly greater on the orange juice than on the grape juice. However, the ratio of the quantity excreted to that ingested was much higher for the grape juice than for the orange juice. In one subject the citric acid excreted was 20 percent higher than the quantity ingested. The increase in citric acid with the orange juice represented only 40–60 percent of the total increase of organic acids and with the grape juice from 35 to 40 percent.

It is concluded that most of the citric acid excreted must have been of metabolic origin.

II. *Effect of ingestion of citric acid, sodium citrate, and sodium bicarbonate.*—To study further the origin of citric acid excretion, the effect of the ingestion of citric acid, sodium citrate, and sodium bicarbonate on urinary excretion was studied in six young women subjects, four of whom were subjects in the earlier study. Observations were also made of the effect on urinary pH, titratable acidity, and excretion of total organic acids.

Citric acid produced little or no change in the pH of the urine, a slight decrease in titratable acidity, a decrease in total organic acids, and sometimes an increase and sometimes a decrease in citric acid excretion.

Sodium citrate in amounts chemically equivalent to the citric acid produced a marked increase in urinary pH and in total organic acids excreted, a marked decrease in titratable acidity, and a marked increase in every subject in citric acid excretion. The total organic acids and citric acid excreted amounted to two or three times the excretion on the basal diet.

Sodium bicarbonate produced an increase in urinary pH, a decrease in titratable acidity, a small increase in total organic acids, and a considerable increase in citric acid excretion.

The author concludes that citric acid excretion is not dependent upon citric acid ingestion, but that citric acid is one of the organic acids functioning in acid-base balance regulation.

Vitamins, A. SCHEUNERT and M. SCHIEBLICH (*Vitamine. In Handbuch der Lebensmittelchemie. Berlin: Julius Springer, 1935, vol. 2, pt. 2, pp. 1469–1554, figs. 47*).—This is essentially a laboratory manual on methods for the quantitative determination of the vitamins. Following an introductory section in

which directions are given for the care and feeding of rats, mice, guinea pigs, and pigeons for vitamin testing, separate chapters are devoted to vitamins A, D, E, B, and C, with general directions for the care, caging, and diet of the experimental animals and technics for the various methods in current use, including chemical as well as biological. The subject matter is brought up to the latter part of 1934 by an addendum. Abundant references to the original literature are given as footnotes, and photographs and diagrams of apparatus, photographs of animals, and typical weight curves are included.

The advisability of the standardization of the vitamin content of certain foods, E. W. McHenry (*Canad. Pub. Health Jour., 26 (1935), No. 3, pp. 124–127*).—In illustration of the need of standardization of the vitamin content of foodstuffs on the market, data obtained by a modification of the Birch, Harris, and Ray method of estimating vitamin C are reported on the vitamin C content expressed as international units per cubic centimeter and as milligrams of ascorbic acid purchasable for 1 ct. on the basis of current retail prices in Toronto of seven brands of tomato juice and the extracted juice from four brands of canned whole tomatoes. The range was from 1.7 to 5.6 international units per cubic centimeter and from 1.3 to 13.3 mg for 1 ct.

That fairly wide variations may exist in the vitamin C content of canned tomatoes of the same brand is shown by the values for ascorbic acid in 7 cans of two brands each of canned strained tomatoes prepared for infant feeding. In one of the brands the range was from 9.6 to 11.2 and in the other from 5.4 to 11.1 mg per cent. The ascorbic acid content of 6 individual lemons varied from 42 to 65 and in 4 tomatoes from 18 to 36 mg per cent. The average ascorbic acid content of the various tomato products tested was raw tomatoes 27, canned tomatoes 22, tomato juice 19, and canned strained tomatoes—brand A 10 and brand B 8 mg per cent.

The desirability of and difficulty in standardizing the vitamin content of food products are discussed, and two regulations are suggested in the interest of safeguarding the public: "(1) No advertising claims should be permitted for vitamins in any food unless the claims were based on actual determinations on the food in question. (2) A minimal vitamin content for any food should be fixed. This value should be stated on the label and in advertising."

Simplification of vitamin tests.—The effect of giving doses half-weekly for vitamin A tests, and once only for vitamin D tests, instead of giving doses daily, K. H. Coward and K. M. Key (*Biochem. Jour., 28 (1934), No. 3, pp. 870–874*).—In determining the vitamin A content of a certain sample of cod-liver oil by the authors' method (E. S. R., 65, p. 588), identical results were obtained when the required amount of the oil was given either daily or twice a week. The probability that the results were really and not apparently identical was demonstrated by statistical calculations.

Practically equal results were also obtained in two vitamin D experiments (E. S. R., 69, p. 631), using the sample of cod-liver oil and the international standard for vitamin D when the whole dose was given at the beginning of the 10-day curative period and when the amount was divided into 10 equal doses. The single dose appeared by calculation to give slightly more accurate results than the repeated doses.

The relation of the growth response to dosage of vitamin A.—Confirmation of a curve relating response to dose of vitamin A given, K. H. Coward (*Biochem. Jour., 28 (1934), No. 3, pp. 865–869*).—Evidence that a curve of response to graded doses of a material being tested in vitamin determinations may be unreliable in the case of vitamin B_1 (E. S. R., 72, p. 568) and vitamin D (E. S. R., 69, p. 631) led the author to reexamine all of the results of

vitamin A tests in her laboratory in which two or more doses of any one substance had been given (E. S. R., 65, p. 588). The method followed was to compare the known ratio of two doses of the substance tested with the apparent ratio as obtained from the abscissas of the curve of response corresponding to the mean increases in weight of the rats given the respective doses. As thus tested with 12 different substances satisfactory agreement between the two ratios was secured, demonstrating the reliability of the curve and the completeness of the basal diet in all needed factors other than vitamin A. "The range of doses which can be compared by the use of this curve extends from a dose which is just sufficient to maintain weight of rats which have ceased to grow on a diet deficient in vitamin A to a dose which is 50 times as great. There is no 'flattening' of the curve, and it is therefore concluded that there is no deficiency in the basal diet except vitamin A."

Similar curves of response have been calculated from data reported by Sherman and Munsell for tomato juice (E. S. R., 54, p. 89) and Sherman and Batchelder for dried milk (E. S. R., 66, p. 391), and the differences between these and the author's curves are discussed. It is emphasized that no laboratory should adopt the curves of response calculated in another laboratory without confirming them, but that the confirmation does not need as many rats as were used in the construction of the curves.

A diet without caseinogen for use in the determination of vitamin A, R. S. MORGAN (*Biochem. Jour., 28 (1934), No. 4, pp. 1178–1192, figs. 2*).—The diet recommended has the following composition: Ground flaked rice 48, coconut meal 30, defatted meat meal 10, dried yeast 8, and salt mixture (Steenbock's No. 40) 4 percent, with vitamin D 8 units per week. This diet, unsupplemented with vitamin A, is said to produce arrest of growth of young rats in about 3 weeks, with restoration of growth on the addition of vitamin A, the response being proportional to the dose. In carrying out vitamin A determinations, the test substance and the carotene standard are fed at three or four levels, and the growth of each rat receiving a dose of test substance is compared with that of a matched rat receiving the standard.

Data are given showing that the limits of error are much lower on this diet than on one containing casein. Previous findings of Coward (E. S. R., 68, p. 565; 70, p. 876) that about twice as many females as males are required to obtain results of the same degree of accuracy and that the error of tests with an experimental period of 3 weeks is only slightly greater than that for 5 weeks are confirmed.

Peanut oil which has stood over quinol is used as a solvent for the carotene standard.

The curative method of vitamin A assay, M. B. RICHARDS and B. W. SIMPSON (*Biochem. Jour., 28 (1934), No. 4, pp. 1274–1292, figs. 6*).—Difficulties encountered by the authors and other investigators in the curative method of vitamin A determinations are discussed, with illustrative data from the authors' experience. The factors discussed include irregularity in the weight curves during the preliminary period, composition of basal diet, type of experimental animals, weight curves during the test period, estimation of end of depletion period, diversity of pathological conditions after the preliminary period, anomalous responses during the curative period, and reserve stores of vitamin A in young rats.

The explanation of the various types of discrepancies is thought to lie in the differing pathological conditions of the animals at the end of the depletion period. "The diversity of these conditions and their frequent lack of amenability to treatment constitute sources of error in the curative method which

it seems impossible to eliminate. . . . It is suggested that any biological assay of vitamin A to be satisfactory must be of the prophylactic type. Its object should be to determine, not the amount of vitamin A which will produce fairly satisfactory weight curves in animals of inferior type, but the amount which will keep first-class animals in first-class condition, as evidenced not only by the weight curves but by post mortem examination of the tissues."

The detection of vitamin A in the blood [trans. title], A. CHEVALLIER and Y. CHORON (*Compt. Rend. Soc. Biol.* [*Paris*], *118* (*1935*), *No. 9, pp. 889–891*).—In applying their spectroscopic method of determining vitamin A (E. S. R., 70, p. 152) to blood, the authors experienced unsurmountable difficulties in using blood in the digestive phases because of its high fat content, and found it necessary to use blood from animals which had fasted for 12 hr. The technic finally adopted as most satisfactory consisted in adding to 3 cc of blood containing fluorine 20 g of desiccated sodium sulfate, and after sufficient time for dehydration, 20 g of absolute spectroscopic alcohol. After standing an hour in a closed flask, the solution is ready to use in the absorption cell. Under these conditions and using only fasting animals, similar values have been obtained for the vitamin A content of the blood of rats, guinea pigs, rabbits, hogs, sheep, horses, cattle, and man.

The authors conclude that the blood of fasting mammals contains a practically constant amount of vitamin A which corresponds to absorption in the neighborhood of log $\frac{I_o}{I}=0.025$ for 1 g of blood, with the absorption cell containing 7 cc of alcohol and having a thickness of 1 cm.

The influence of the solvent on the vitamin A activity of (a) carotene and (b) cod-liver oil, F. J. DYER, K. M. KEY, and K. H. COWARD (*Biochem. Jour.*, *28* (*1934*), *No. 3, pp. 875–881*).—In an effort to explain the widely different responses to the same dosage of the international carotene standard for vitamin A reported by various investigators, a direct comparison was made of the vitamin A value of a definite quantity, 5γ, of the standard dissolved in hardened cottonseed oil, redistilled ethyl laurate, and peanut oil. The solution in peanut oil proved to be from 5 to 6 times as potent as the solutions in cottonseed oil and ethyl laurate. A second comparison of solutions of equal strength in peanut oil and coconut oil gave approximately the same results for the peanut oil solution and 3 samples of coconut oil, while a fourth gave a slightly less potent solution.

Similar tests with cod-liver oil diluted with different solvents gave 3 times as great a potency for the cod-liver oil when dissolved in coconut oil as in hardened cottonseed oil or olive oil, although the coconut oil itself was without vitamin A potency. When the cod-liver oil and the standard carotene for comparison were both dissolved in peanut oil, the same vitamin A values for the oil were obtained as when both were dissolved in coconut oil.

The effect of mineral oil administration upon the nutritional economy of fat-soluble vitamins, II, III, R. W. JACKSON (*Jour. Nutr.*, *7* (*1934*), *No. 6, pp. 607–622, figs. 2*).—Two papers are presented.

II. *Studies with the vitamin A factor of yellow corn* (pp. 607–616).—With the same general technic as in the first study of the series (E. S. R., 66, p. 592), the author has demonstrated that mineral oil fed separately from restricted doses of yellow corn interferes considerably with the assimilation of the vitamin A of the corn by the albino rat.

III. *Studies with vitamin D of irradiated ergosterol* (pp. 617–622).—In vitamin D tests, following somewhat the same plan as in the vitamin A tests, it has been demonstrated that mineral oil administered separately from irradiated ergosterol does not interfere with the utilization of vitamin D.

Vitamin studies.—XIX, The assimilation of carotene and vitamin A in the presence of mineral oil, R. A. Dutcher, P. L. Harris, E. R. Hartzler, and N. B. Guerrant (*Jour. Nutr., 8 (1934), No. 3, pp. 269–283, figs. 7*).—This continuation of the series of papers noted previously (E. S. R., 69, p. 298) presents data confirming the results reported in an earlier paper of the series (E. S. R., 58, p. 88), showing that the vitamin A potency of butterfat is lowered when fed at low levels with mineral oil. With larger amounts of butterfat in the presence of relatively small amounts of the mineral oil, the effect was less marked though still detectable. The vitamin A potency of a sample of cod-liver oil and a cod-liver oil concentrate was not lowered by the presence of mineral oil.

In explanation of the differences in behavior of these two sources of vitamin A, the hypothesis is advanced that "the hydrocarbons of the unassimilated mineral oil possess a greater solvent effect on the hydrocarbon carotene than is possessed by the lipides of the intestinal juices, thereby preventing intestinal absorption of carotene. Conversely, it is suggested that the lipides and sterols of the digestive juices possess a preferential solvent effect on the sterol vitamin A, thereby promoting utilization by removing this vitamin from the unassimilated mineral oil."

Utilization of vitamin A and carotene (*Jour. Amer. Med. Assoc., 103 (1934), No. 20, p. 1540*).—In this editorial discussion of the paper of Dutcher et al. noted above and others dealing with the question of utilization of vitamin A in the presence of mineral oil, it is emphasized that in practice the usual manner of taking the oil (apart from the meal) virtually eliminates the danger of loss of vitamin A or carotene.

The fat-soluble vitamins and dental caries in children, C. D. M. Day and H. J. Sedwick (*Jour. Nutr., 8 (1934), No. 3, pp. 309–328*).—To test the possible effect of vitamins A and D upon the progress of dental caries in children, a group of about 500 seventh grade children was examined minutely for dental caries. Half of the group were then given tablets of a concentrate of vitamins A and D for 1 yr. in amounts furnishing not less than 6,000 U. S. P. units of vitamin A and 1,400 Steenbock units of vitamin D daily. The other children, who were from the same social level, received no supplement. At the end of the year the same thorough examination of the teeth was given all of the children. Comparisons of the dental findings at the beginning and end showed no beneficial effect from the vitamin supplement as judged by the average increase in percentage of affected teeth, the average percentage increase in the number of cavities or in the number of cavities per mouth, and the percentage increase in the average caries figure. The percentage of teeth which erupted and became carious during the year was as high in the group receiving concentrates as in the control group.

"One, therefore, feels justified in drawing the conclusion that without otherwise altering the diet the administration of vitamins A and D to children of this age and within the period of this investigation has no appreciable effect upon the rate of progress of the caries process in teeth already erupted or which erupt during the experimental period."

Vitamin A in eye tissues, G. Wald (*Jour. Gen. Physiol., 18 (1935), No. 6, pp. 905–915, figs. 2*).—Essentially noted from preliminary reports (E. S. R., 72, p. 280).

Keratinization of the epithelial mucous membrane in vitamin A and carotene deficiency; vitamin A as an antiinfective agent [trans. title], **H. v. Euler and M. Malmberg** (*Hoppe-Seyler's Ztschr. Physiol. Chem., 232 (1935), No. 1–2, pp. 1–5*).—The literature on kolpokeratosis (keratinization of

the vaginal mucosa) as a delicate test for vitamin A deficiency in rats and also in guinea pigs is reviewed briefly, and a few data are reported showing the failure of this test as a sign of vitamin A deficiency in white mice. The mice also showed no xerophthalmia following long subsistence on a vitamin A-free diet.

Further evidence of the antiinfective action of vitamin A in rats is noted in the observation that during an epidemic of rat pasteurellosis (*Bacterium haemosepticum*) in the authors' colony, the rats on diets with adequate vitamin A or carotene were not affected. The susceptibility of the rats on the deficient diet is attributed to the keratinization of the mucous membranes, and this in turn to a lowered content of purines, specifically nucleo proteins, for cell formation.

Growth and vitamin A deficiency, J. B. ORR and M. B. RICHARDS (*Biochem. Jour., 28 (1934), No. 4, pp. 1259–1273, figs. 6*).—This is a detailed report of an extensive investigation, noted previously from a preliminary report (E. S. R., 72, p. 881), of the correlation of loss in weight and actual cessation of growth, as determined by body length, of rats on a vitamin A-deficient diet. Measurements of body length and tail length of live animals and of skeletal length after death showed that while loss in weight always resulted from vitamin A deficiency, in the case of young animals the body continued to increase in length. Loss in weight, therefore, cannot be taken as an index of failure to grow, and the term "growth-promoting" as applied to vitamin A should no longer be used. Only insofar as vitamin A aids in maintaining a condition of health which is not favorable to the development of pathological conditions and subsequent loss in weight can it be considered a growth-promoting factor. This applies also to the use of the term "antiinfective."

Pyruvic acid as an intermediary metabolite in the brain tissue of avitaminous and normal pigeons, R. A. PETERS and R. H. S. THOMPSON (*Biochem. Jour., 28 (1934), No. 3, pp. 916–925*).—This is the detailed report of an investigation noted previously from a preliminary report (E. S. R., 71, p. 882).

The vitamin B supplementation of milk, G. C. SUPPLEE, R. C. BENDER, and G. E. FLANIGAN (*Jour. Nutr., 8 (1934), No. 3, pp. 365–375, fig. 1*).—The plan followed in this study was to determine by the Chase-Sherman method the vitamin B content of certain rice polish derivatives and milk solids, and then to feed these substances singly and in combination as the source of vitamin B in the same ration to determine the growth responses from different amounts of vitamin B as supplied from these different sources. The rice polish extracts included an aqueous extract prepared from crude rice polish by shaking 1 part of polish with 4 parts of water at 7° C. for 4 hr. and the more highly purified concentrate prepared by the Sure method (E. S. R., 68, p. 705). The dry milk used was the Dryco brand irradiated prior to drying by the Just process.

The growth responses for the same concentration of vitamin B were of the same order for the aqueous extract of rice polish and the rice polish concentrate of Sure, both being greater than for the unsupplemented dry milk. The highest rate of growth was obtained from the milk supplemented with the Sure concentrate.

These findings are interpreted as indicating that a specified rate of growth cannot be considered an infallible criterion for judging the absolute amount of vitamin B present, for the presence of other dietary constituents or definite relationships between these constituents and the amount of vitamin B appear to determine the rate of growth.

A vitamin B deficient ration, R. C. BENDER, G. E. FLANIGAN, and G. C. SUPPLEE (*Jour. Nutr., 8 (1934), No. 3, pp. 357–363, fig. 1*).—Dry whey, commercial dry skim milk prepared by the roller process, and fluid skim milk, all made alkaline with sodium hydroxide solution, sodium bicarbonate, or hydrated lime,

were autoclaved for varying periods of time up to 5 hr., with and without the addition of water to the dry products. Three samples of yeast were similarly treated except that the period of heating was 5 hr. only. After autoclaving, all of the products were dried in the air or oven at temperatures not exceeding 100° C. and compared for their vitamin B and G content in rat-feeding tests.

The dried whey and dried skim milk autoclaved for 2 hr. at 120° were quite similar in showing practically complete absence of vitamin B and the presence of vitamin G in a concentration such that 15 percent of the material sufficed for good growth in a diet otherwise deficient in this vitamin. The results with the autoclaved yeast samples showed less complete destruction of vitamin B.

The satisfactory results with the autoclaved dry whey have led to its adoption as a source of vitamin G in vitamin B tests. The procedure for its preparation and use is described in detail.

The utilization of energy producing nutriment and protein as affected by individual nutrient deficiencies.—II, The effects of vitamin B deficiency, F. J. McClure, LeR. Voris, and E. B. Forbes (*Jour. Nutr., 8 (1934), No. 3, pp. 295–308, fig. 1*).—In this continuation of the series of studies noted previously (E. S. R., 72, p. 371), the effects of vitamin B (B_1) on the utilization of food energy and protein by rats were studied in growth, metabolism, and body analysis experiments by the paired feeding method. "The effects of vitamin B deficiency were (1) a specific depressing effect on appetite, but no certainly significant influence on gain in weight per unit of food; (2) a decided decrease in the quantities of fat and energy gained; (3) a lower body temperature; (4) a slight increase in digestibility of protein, but no effect on the digestibility of energy-producing nutrient; (5) a diminished efficiency of utilization of metabolizable energy for body gain; (6) an increased energy outgo, as urine and heat, and an increased ratio of carbon to nitrogen in the urine; and (7) an apparent depression of the oxidative processes of the organism."

The action of crystalline vitamin B_1 on the respiration of polyneuritic tissues in vitro, R. H. S. Thompson (*Biochem. Jour., 28 (1934), No. 3, pp. 909–915, fig. 1*).—The experiments reported were undertaken with the hope of finding out whether added vitamin B_1 showed any catatorulin activity in the muscle, heart, liver, and kidney tissues of polyneuritic pigeons, as had been demonstrated previously by Passmore et al. (E. S. R., 71, p. 7) for brain tissue.

Following the same methods as in the earlier study, the addition of crystalline vitamin B_1 was found to increase the oxygen uptake of the avitaminous kidney, but to have no significant effect upon the muscle, heart, and liver tissues. The respiration of the kidney in the presence of lactate and absence of vitamin B_1 was found to be lower than that of normal kidney.

Relation of vitamin B (B_1) intake to neurological changes in the alcohol addict, N. Jolliffe and P. M. Joffe (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1161, 1162*).—"The Cowgill formula predicting the vitamin B requirement of man has been applied to the diets of alcohol addicts in order to estimate the adequacy of the vitamin B intake. Sixteen subjects showing peripheral neuritis had for at least 22 days an inadequate Vit/Cal ration. Four subjects who consumed large amounts of liquor, but with an adequate Vit/Cal ratio, showed no abnormal neurological signs. Four subjects having an inadequate ratio for 18 days or less showed no significant neurological changes. These findings support the theory that peripheral neuritis in the alcohol addict is the result of vitamin B deficiency."

Flavines and vitamin B_2, I [trans. title], H. v. Euler, P. Karrer, and E. Adler (*Arkiv Kemi, Min. och Geol., 11B (1934), No. 4, Art. 33, pp. 6*).—Samples of analytically pure crystalline lactoflavine, ovoflavine, and hepaflavine, showing no differences in chemical properties or in melting point, were found

to have very different biological properties as a source of vitamin B_2. The possibility is suggested that there may be more than one active flavine or flavinelike compound, or that the vitamin B_2 activity of crystalline flavine preparations is due to the presence of a much more active nonflavinelike substance. As evidence of the flavine nature of vitamin B_2, it is noted that on dialysis the proportions of flavine and of vitamin B_2 activity in the dialyzable and nondialyzable fractions are the same, and in the nondialyzable fraction the vitamin B_2 activity runs parallel with the content of high molecular flavine as determined fluorometrically. The destruction of flavines by light is paralleled by the destruction of biological activity.

A simplified method for preparing lactoflavin and a study of its growth effect, S. Itter, E. R. Orent, and E. V. McCollum (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 579–583*).—A method of preparing lactoflavine from dried whey with hot 95 percent alcohol is described, and data are reported on its use as the source of vitamin G in a basal diet in which vitamins B_1 and B_4 were furnished in the form of a fuller's earth adsorbate of an extract of rice bran prepared according to the method of Evans and Lepkovsky (E. S. R., 65, p. 613). As thus tested, the lactoflavine was active in doses as small as 100γ daily. "These results, therefore, substantiate the fact that the flavines are a component of vitamin B_2."

The possible rôle of the sulfhydryl group in vitamin B_2 deficiency, S. Itter, E. R. Orent, and E. V. McCollum (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 585–594, fig. 1*).—Determinations of the glutathione content of the blood and liver of rats on the vitamin B_2-free diet of Evans and Lepkovsky alone and supplemented with 5 percent dried yeast, 15 percent autoclaved yeast, 15 percent autoclaved yeast plus 1 mg glutathione, 1 mg glutathione, and 1 mg cysteine hydrochloride daily showed that the glutathione content of the blood and lungs was lower on the basal diet alone than on the diet supplemented by dried yeast, and that the addition of autoclaved yeast, cysteine, or glutathione failed to restore the glutathione content of the blood to the normal as represented by the basal diet plus dried yeast. In the liver, however, the glutathione values were increased above that on the basal diet plus dried yeast by the addition of autoclaved yeast plus glutathione, glutathione alone, and (very slightly) cysteine hydrochloride. It is suggested that there is some factor in untreated yeast required to maintain the normal content of these sulfur compounds in the blood.

Adrenalectomy produced no obvious effect on the glutathione content of the blood, and the ingestion of anterior pituitary gland failed to increase the glutathione content of the liver.

The administration of glutathione or cysteine to rats depleted of vitamin B_2 resulted in maintenance of weight over a period of 6 weeks, during which the controls were losing weight. Vitamin B_2-deficient rats showing alopecia were cured by the daily feeding of glutathione and to a lesser degree by cysteine, while lactoflavine, although more active as a growth supplement, failed to cure the alopecia in the one case tested.

The authors conclude that a vitamin G deficiency may be frequently complicated by a deficiency of a sulfhydryl-containing substance. A low protein diet or a diet in which the cysteine of the casein has been partially or wholly destroyed by the process of purification would tend to introduce a deficiency of these compounds and result in a greater incidence of dermatitis.

Vitamin B_5, J. R. O'Brien (*Biochem. Jour., 28 (1934), No. 3, pp. [illegible], figs. 4*).—The conflicting literature concerning the existence of a component of the vitamin B complex necessary for the nutrition of the pigeon and designated

as vitamin B_4 is reviewed briefly, and a series of experiments on pigeons is reported leading to the conclusion that the pigeon does require in addition to vitamin B_4 a factor to restore weight. The richest sources of this factor, vitamin B_5, proved to be wheat germ and dried yeast. Egg yolk was found to contain some of the factor, and malt extract and marmite still less. Egg white, liver powder, and milk in large doses failed to restore growth, and large doses of the Kinnersley-Peters vitamin B_1 concentrate were also without effect.

A concentrate of the factor was prepared from wheat germ by acid hydrolysis. The active extract, which also contained vitamin B_1, lost its B_5 activity very rapidly on standing at room temperature or after from 6 to 8 days in cold storage. The loss in activity is attributed to oxidation. The method of preparing the extract, together with its properties, suggested the possibility that the factor might be an amino acid, but negative results were obtained in tests in which known amino acids, which are present in negligible amounts in polished rice, were fed in conjunction with vitamin B_1 as a supplement to polished rice.

Fresh vegetables rich in vitamin C, D. K. TRESSLER (*Farm Res.* [*New York State Sta.*], *1* (*1935*), *No. 4, pp. 1, 3*).—Included in this brief summary of the function and chemical properties of vitamin C, the latter with special reference to losses that may be predicted in the preparation of vegetables for the table, are data on the vitamin C content (presumably determined by chemical methods) of several vegetables in percentages of the fresh material as follows: Orange juice 0.04 to 0.06, tomato juice 0.018 to 0.024, pepper (red) 0.2 to 0.23, pepper (green) 0.18 to 0.2, parsnip greens 0.21 to 0.216, parsnip roots 0.036 to 0.04, horseradish 0.16, parsley greens 0.14 to 0.18, turnip greens 0.11 to 0.12, turnip root 0.032 to 0.038, cabbage 0.02 to 0.1, spinach 0.06 to 0.1, water cress 0.05 to 0.076, peas 0.016 to 0.031, rhubarb 0.021 to 0.025, potato 0.015 to 0.022, and green beans (fresh) 0.012 to 0.015 percent.

On the nature of the precursor of the vitamin C in the vegetable kingdom.—I, Vitamin C in the growing pea seedling, S. N. RAY (*Biochem. Jour.*, *28* (*1934*), *No. 3, pp. 996–1003, figs. 3*).—Further study of the occurrence of ascorbic acid in pea seedlings, as measured by the micro method of Birch, Harris, and Ray (E. S. R., 70, p. 741), has shown that the concentration of the acid rises rapidly after germination and reaches a constant value after 2 days of 0.5 mg per gram of seedlings, wet weight. In order to study the possible source of ascorbic acid, the seedlings were grown on different nutrient solutions containing gelatin plus glucose, fructose, galactose, mannose, sucrose, lactose, and a number of other organic compounds. Embryo seedlings from which the cotyledons had been removed synthesized a large amount of ascorbic acid when grown on nutrient gelatin containing hexoses, mannose giving the highest value. The concentration of ascorbic acid decreased during the cultivation of excised seedlings. The rate of production of ascorbic acid and the rate of growth of the seedlings in nutrient media containing different concentrations of hexoses showed no correlation.

The results on the whole are thought to support the view that ascorbic acid may be formed from hexoses present in the seeds.

Synthesis of ascorbic acid (vitamin C) by means of tissues in vitro, B. C. GUHA and A. R. GHOSH (*Nature* [*London*], *134* (*1934*), *No. 3393, p. 739*).—The production of ascorbic acid in vitro from various sugars by incubation at 37° C. for 3 hr. with minced liver, kidney, and spleen tissues of the rat in the presence of a phosphate buffer of pH 7.4 or of the phosphate buffer and Ringer-Locke solution was attempted, with negative or insignificantly positive results for glucose, fructose, galactose, arabinose, and xylose. In the experi-

ments with mannose, however, significant quantities of ascorbic acid were formed in the presence of all three of the tissues.

Attention is called to the observation by Ray, noted above, that in pea seedlings mannose has a remarkable effect on the formation of ascorbic acid. "This would indicate a similarity between the mechanisms involved in the above transformation occurring in the animal and plant tissues investigated."

The ascorbic acid content of certain citrous fruits and some manufactured citrous products, A. L. Bacharach, P. M. Cook, and E. L. Smith (*Biochem. Jour., 28 (1934), No. 3, pp. 1038–1047*).—In the determinations reported the Tillmans indophenol method, with some modifications, was used for the most part, with a few titrations with standard iodine solution for comparison. The two methods gave results in good agreement, although the former is considered the most specific chemical test available and capable of giving appreciably more reproducible results than the iodine method.

Oranges, tangerines, and lemons from different sources were tested, with minimum, maximum, and average ascorbic acid values as follows: Oranges (39 samples) 0.22, 0.89, and 0.51 mg per cubic centimeter juice; tangerines (9 samples) 0.1, 0.78, and 0.37 mg; and lemons (15 samples) 0.47, 0.73, and 0.64 mg per cubic centimeter of juice, respectively. Storage of the fruit at room temperature for approximately 4 weeks resulted in an ascorbic acid loss of nearly 20 percent for oranges and only about 6 percent for lemons. The sample of concentrated orange juice from California showed only negligible loss in ascorbic acid, as determined by titration and by biological assay, from values reported for the original juice and concentrate immediately after preparation.

Several samples of commercial and one of home-made marmalade were examined for the apparent content of peel and for content of ascorbic acid. Nearly all of the commercial brands contained appreciable amounts of ascorbic acid, ranging from 0.06 to 0.14 mg per gram. Some correlation was evident between the amount of ascorbic acid and the amount of peel present. The home-made marmalade gave almost negative results. A study of the distribution of ascorbic acid in the flavedo, albedo, whole peel, and juice of 5 Saville (bitter) oranges and single samples of the sweet orange, tangerine, and lemon showed that in all cases the flavedo contained the largest amount of ascorbic acid, followed by the albedo and the juice. As the albedo constitutes a larger proportion of the whole orange than the flavedo, the order of ascorbic acid in the whole fruit is albedo, flavedo, and juice. In the Saville orange the distribution in these three parts was found to be 45, 40, and 15 percent, respectively.

It is suggested that the preservation of vitamin C in products such as marmalade should offer no serious manufacturing difficulties. "By appropriate selection of fruit containing the right quantity and distribution of vitamin C, with special reference to the proportion of peel and juice to be included in the finished marmalade, the manufacturer should be able to produce a marmalade of standardised vitamin C content and of any value required within the limits permitted by the natural content of the fruit. The matter is by no means one of purely academic interest; there must be many households where practically the sole sources of vitamin C available to a growing family are potatoes and marmalade; variations in the antiscorbutic potency of the latter might have an appreciable effect on the vitamin C intake of the growing child."

Relation between vitamin C and the carotenoids.—The ripening of fruits [trans. title], A. Giroud, R. Ratsimamanga, and C. P. Leblond (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 9, pp. 874–876*).—Attention is called to a cer-

tain parallelism between the carotenoid and the vitamin C content of plant materials. In illustration, the ascorbic acid values obtained by the Tillmans method are given as follows for certain fruits in the unripe state and after the development during ripening of a definite color attributed to carotenoids: Tomato, unripe 0.27 and ripe 0.33 mg per gram; orange, 0.45 and 0.5; and pimiento, 1.73 and 1.82 mg per gram, respectively. Examples are given of fruits in which the color is not due to carotenoids and the vitamin C content is low in comparison with others which contain carotenoids and have a high vitamin C content. In the former group are prunes 0.01, medlar 0.02, pear 0.05, and peach 0.08 mg ascorbic acid per gram, and in the latter tomato 0.33, orange 0.5, and rose hips 4.59 mg per gram.

The influence of vitamin C (ascorbic acid) on plant and animal amylases, A. PURR (*Biochem. Jour., 28 (1934), No. 3, pp. 1141–1148*).—An earlier study of the effect of ascorbic acid on proteolytic enzymes (E. S. R., 72, p. 586) has been extended to plant and animal amylases. Using as the source of animal amylases human saliva, pig pancreas, and rat liver, and of plant amylases barley, green malt, and purified amylases from both, it has been shown that ascorbic acid is a specific activator for the β-type of animal amylase and an inhibitor of the β-type of plant amylase, but has no effect on the α-type of plant amylase. The oxidized form of ascorbic acid was found to have no effect on the β-form, but to inhibit the α-amylase of plants.

A study is also reported of the changes occurring in the activity of several kinds of amylases during the ripening of barley, rye, and oats grains. In the first stage of the development of the grain the same amylase relationship was found to exist as in the sprouting grain, but as the grain approached ripening the α-amylase gradually became inactive. The decrease in vitamin C during the ripening of grains is thought to be related to the inactivation of the α-amylase.

Variation in the content of ascorbic acid (vitamin C) in the tissues [trans. title], A. GIROUD and C. P. LEBLOND (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 12, pp. 1179–1182, fig. 1*).—On the basis of previous studies (E. S. R., 73, p. 425), the authors consider the normal ascorbic acid content of the adrenal cortex to be 1 mg per gram of fresh tissue. This value is thought to be stable in animals which do not require vitamin C in their diet and unstable in those which do, but cannot be exceeded no matter how much of the vitamin is administered. The lowest limit of ascorbic acid in the adrenal cortex compatible with life is considered to be in the neighborhood of 0.04 mg per gram of fresh tissue. On diets partially deficient in vitamin C the content may be in the vicinity of 0.25–0.3 mg, at which level there is evidence of more or less disturbance. At a level of 0.3–1 mg the animals may live indefinitely, sometimes without visible signs of the deficiency but often with slight scorbutic symptoms. It is suggested that this may be the case in human beings on diets habitually low in vitamin C.

The authors' acid silver nitrate test is said to give very weak or negative results at ascorbic acid levels as low as 0.25–0.3 mg. At this level the Tillmans test and that of Bezssonoff are considered more sensitive. Curves are given showing the fall in ascorbic acid content as determined by the Tillmans method of the kidneys, testicles, and adrenals of normal guinea pigs submitted to the vitamin C-free diet of Randoin and Lopez-Lomba.

Ascorbic acid or vitamin C in the different parts of the hypophysis [trans. title], A. GIROUD, C. P. LEBLOND, and R. RATSIMAMANGA (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 13, pp. 1311, 1312*).—Earlier studies of the distribution of ascorbic acid in the hypophysis (ox), using the acid silver ni-

trate method (E. S. R., 72, p. 421), have been repeated with the Tillmans reagent with the following results: Anterior lobe 1.65, intermediate lobe 2.01, and posterior lobe 0.55 mg per gram of fresh tissue. Attention is called to the fact that the relative distribution of ascorbic acid in the three lobes corresponds to the distribution of glutathione, and that this is also true of the adrenal cortex and medulla and of certain other tissues.

The content of vitamin C in the blood and urine after massive injections [trans. title], P. Rohmer, N. Bezssonoff, E. Stoerr, and J. Pérez (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 11, pp. 1090–1092, figs. 2*).—A sodium hydroxide solution of ascorbic acid at pH 4 was found to produce no local or general reaction when used for subcutaneous or intramuscular injection in guinea pigs and infants in doses of 200 mg per kilogram. Following such injections the content of vitamin C in the blood rose to 0.25 mg per 100 cc in the course of the first hour. In infants 2 hr. after the injection the content was 0.12 mg, the values decreasing more rapidly than in the guinea pig. After 15 hr., the values were about the same for infants and guinea pigs and continued to decrease at a slow rate. At about the fifteenth hour the concentration of vitamin C in the urine of the infant rose sharply. The urinary excretion of vitamin C in the guinea pig was very small.

In the authors' experience the Tillmans test for ascorbic acid gave unreliable results with blood. The Bezssonoff reagent used in the present study is considered to give reliable results. The technic as applied to blood is given in detail.

The urinary excretion of ascorbic and dehydroascorbic acids in man, S. W. Johnson and S. S. Zilva (*Biochem. Jour., 28 (1934), No. 4, pp. 1393–1408, fig. 1*).—Experiments lasting 8 mo. were conducted on 4 adult subjects to determine the relation between the ingestion and urinary excretion of ascorbic acid and dehydroascorbic acid. The latter, reversibly oxidized ascorbic acid, was prepared by allowing decitrated lemon juice to stand with calculated amounts of iodine and hydrogen peroxide until the indophenol-reducing capacity just disappeared. The ascorbic acid was taken in the form of orange juice when small doses (150–350 mg) were used and of concentrated decitrated lemon juice when higher doses (1,000 mg) were required. The ascorbic acid content of the preparations used and of the urine was determined by direct indophenol titration. During the day the urine was titrated immediately after being passed. Night samples were collected over sulfuric acid and titrated the following morning.

The data obtained show that at least two factors are concerned with the appearance of ascorbic acid in the urine of normal individuals—the degree of saturation of the subject and the quantity ingested. One of the 4 subjects had been on a diet much higher in vitamin C than the others, and the ascorbic acid excreted in the urine amounted to as much as 70–150 mg per day, while the urine of the other 3 subjects did not reduce indophenol to any extent for several days.

The time required to reach the saturation state, as shown by the appearance of ascorbic acid in the urine, was markedly shortened by the ingestion of large doses of ascorbic acid. When storage had been completed, a more or less constant level of urinary output was reached, the amount varying with the magnitude of the dosage. The percentage of ingested ascorbic acid excreted in the urine was lower on high than on low doses.

On discontinuing the intake of ascorbic acid after the subject was fully saturated, the daily output of ascorbic acid fell rapidly, reaching the initial low level in about 24 hr. The subject remained saturated for some time, as shown

by the fact that single doses of ascorbic acid brought the output back to the saturation level. Diuresis induced by excessive intake of water had no effect on the rate or level of the urinary output of ascorbic acid. The rate of excretion tended to be low during the night and to increase soon after rising.

Dehydroascorbic acid always appeared in the urine as ascorbic acid.

Observations on excretion of vitamin C in some vascular diseases, P. Finkle (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 7, pp. 1163, 1164*).—The urinary excretion of vitamin C by 4 normal controls, 5 patients with purpura hemorrhagia, 5 with metrorrhagia, and 2 with acute lupus erythematosus was determined before treatment and from 2 to 3 hr. and 4 to 6 hr. following intravenous injection of 100 mg of cevitamic acid.

In the normal controls, a marked rise in urinary output of vitamin C was observed in the samples of urine taken from 2 to 3 hr. following the injection, with a fall to values not much higher than in the beginning at the later test. In all of the patients studied the urine showed no increase, suggesting that the subjects were not saturated with vitamin C.

On the physiological action of ascorbic acid and some related compounds, V. Demole (*Biochem. Jour., 28 (1934), No. 3, pp. 770–773*).—Various animals, from the axolotl to the dog, were given ascorbic acid by mouth, and by subcutaneous, intraperitoneal, and intravenous injections in doses up to 5 g per kilogram as a single dose or 12 g per kilogram in total amount in repeated doses with no evidence of toxic symptoms and no changes in the kidneys, heart, or lungs as determined by histological examination. The reducing capacity of the urine for Fehling's solution or iodine in KI was increased perceptibly after the administration of the ascorbic acid. With Fehling's solution the reducing capacity reached a maximum in from 2 to 4 hr. and then decreased fairly rapidly, the excretion being complete in from 20 to 24 hr. The urine of a dog which had received large amounts of ascorbic acid by subcutaneous injection cured guinea pigs of scurvy in daily doses of from 0.2 to 1 cc.

Synthetic *l*-ascorbic acid was as active biologically as the *l*-ascorbic acid isolated from paprika, but *d*-ascorbic acid was inactive in doses of 20 mg daily. The only related compound which showed any definite antiscorbutic action was *d*-erythro-3-ketohexonic acid, which had about 1/20 the potency of *l*-ascorbic acid.

The effect of cevitamic acid injections on capillary resistance, G. Dalldorf and H. Russell (*Jour. Amer. Med. Assoc., 104 (1935), No. 19, pp. 1701, 1702, figs. 3*).—The trade preparation of ascorbic (cevitamic) acid known as Cebione, administered by intravenous injection, was found to produce a prompt and marked increase in capillary resistance in subjects with reduced resistance. The first group tested consisted of 14 residents of a local county home. In all but 3 cases the dosage was 100 mg of the acid dissolved in at least 10 cc of distilled water. In the other 3 only 50 mg was used. In another group of 10 county home residents, 4 were found to have fragile capillaries, with an average resistance of 24 cm of mercury negative pressure. These responded promptly to the injections, with an average rise in capillary resistance to 35 cm. "The former value we have come to associate with groups on diets poor in fresh fruits and vegetables; the latter value is the normal for well fed groups."

Three case reports are given in detail, with charts showing response in pressure and, in 2 cases, in concentration of ascorbic acid in the urine. The latter subjects, boys 6 and 10 yr. of age, had been receiving ample amounts of antiscorbutic food, including 4 oz. of fruit juices a day. The low capillary resistance before the injection of ascorbic acid is thought to suggest that individual requirements of antiscorbutic foods vary widely, or that absorption or utilization of the vitamin may be defective.

It is noted that the results obtained in these tests are identical with those reported several years ago (E. S. R., 66, p. 795) as occurring in scorbutic guinea pigs following the injection of neutralized orange juice, and are similar to but more rapid than the effect in both guinea pigs and children of feeding large amounts of antiscorbutic foodstuffs.

Further evidence of insusceptibility of the rat to a dietary deficiency of vitamin C, C. Tum Suden and O. E. Alley (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 753, 754*).—In order to obtain further evidence that the rat requires no dietary supplement of vitamin C, the incisors of rats maintained and reared for three generations on a scorbutic diet were examined histologically according to the method of Höjer.

In all of the teeth examined there was no evidence of abnormality in the organization of odontoblasts, dentine formation, and the vascularity and cellular content of the pulp cavity. No sign of hypertrophy of the adrenals or decrease in the speed of reduction of silver nitrate was observed. "Consequently there was no evidence reflecting a latent or early disturbance resultant from the continuous omission of vitamin C from the diet."

Vitamin D content of calf, beef, lamb, and hog liver, G. M. DeVaney and H. E. Munsell (*Jour. Home Econ., 27 (1935), No. 4, pp. 240, 241*).—The calf, beef, and hog livers used in this study at the Bureau of Home Economics, U. S. D. A., were purchased every few days at local markets. Livers from 7- to 8-month-old lambs were obtained twice during the experimental period from the slaughterhouse and kept in a frozen condition until used. The Steenbock rickets-producing diet was used with the line test technic. At least 1 rat from each litter was given 0.2 unit of the international standard viosterol in peanut oil solution. In estimating the vitamin D potency, the procedure of Dyer (E. S. R., 67, p. 345) was followed, using a curve of reference relating the degrees of healing to the number of international vitamin D units.

The values thus obtained were calf liver 0.095, beef 0.47, hog 0.44, and lamb liver 0.17 international units per gram of fresh material.

In view of the scanty distribution of vitamin D in food materials, liver in general may be considered a significant source of the vitamin.

Anti-anemia potency of liver after gastrectomy in swine, L. Goodman, A. J. Geiger, and L. N. Claiborn (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 810–812, fig. 1*).—Preliminary observations are reported on the anti-anemia potency of extracts prepared by the same process as used for the pernicious anemia Lilly extract 343 from the livers of swine sacrificed 2 and 4 mo., respectively, following gastrectomy, and tested by intramuscular injections in patients with pernicious anemia. The extract from the liver of the animal sacrificed 2 mo. after gastrectomy proved less potent than the liver extract 343, and that from the animal killed 4 mo. after gastrectomy even less active.

The observations are thought to indicate that after total gastrectomy the anti-anemia potency of the liver becomes progressively depleted.

TEXTILES AND CLOTHING

A study of wool flannels, serges, and gabardines: The relationships between physical properties and cost of staple wool materials, E. L. Phelps, R. Giraud, M. Dietrich, and E. Thompson (*Minnesota Sta. Tech. Bul. 104 (1935), pp. 80, fig. 1*).—Six samples of serges, 9 of gabardines, and 14 of dress flannels were purchased in 1927 and 1928 from representative retail stores, jobbers, and mail-order houses in Minneapolis and St. Paul and studied for the following measurable variables and distinguishing features: Price per square

yard, thickness, weight per square yard, number of yarns per inch, tensile strength of fabric, bursting strength, elongation of fabric under stress, shrinkage, resistance to abrasion, twist of yarns, size of yarns, tensile strength of yarns, and elongation of yarns under stress.

Each of these variables is discussed for each fabric with reference to the relationships found significant by statistical analysis and to data reported in the literature, certain test methods used in the investigation are correlated and compared, and the complete data for each fabric are assembled in an appendix.

Only a few significant relationships were found between price per square yard and the variables measured. These were scattered and for the most part different for all three groups of fabrics studied. The numbers of significant relationships among the variable properties were not uniform for the three groups, with about twice as many for flannels as for either serges or gabardines. The significant relationships common to all three types of fabrics are summarized as follows:

"The thickness of these fabrics increased with the size of the warp yarns, but this relationship may be masked by the influence of the number of warps per inch. The number of fillings per inch increased as the number of warps increased. Fabric strength increased with the number of yarns per inch when yarn strength was eliminated, and also with yarn strength if the influence of the number of yarns per inch was removed. The bursting strength of these fabrics increased with tensile strength in the direction of the warp. The percentage fabric elongation in the direction of the filling increased with the percentage elongation of the filling yarns. Area shrinkage increased with fillingwise shrinkage. The coarsest yarns were the strongest. The finest warps had the greatest unit elongation under stress. The strongest warps had the lowest unit elongation under stress and the highest percentage elongation."

In determining the tensile strength with the strip method, both 3-in. and 6-in. gage lengths were used. The values obtained with the 3-in. gage length were higher than those for the 6-in. gage, but their dispersal was not significantly different. Significant correlation coefficients were obtained between the two series of data only for flannels in the warp direction and for serges and gabardines in the filling direction. A comparison of the strip method (3-in. gage length) with the grab method showed that greater precision was possible with the strip method, although the grab method gave higher values. Considerable difficulty was experienced in testing the warpwise tensile strength of gabardines by the grab method.

In the yarn breaking tests, 50 yarns were used for each test. This number was found to give an approximately uniform average and a fairly uniform degree of precision. The bursting strength determinations were made by the Mullen tester (pressure under a rubber diaphragm) and by the ball-burst tester attachment used on a Scott universal tester. The values with the rubber diaphragm test were approximately one-third higher than with the ball-burst test in all three fabrics. A significant correlation was obtained between the two series of data for all fabrics. The modified serigraph test was found to compare favorably with the strip test for determining yarn strength values for all three fabrics.

An extensive list of literature references is appended.

Further studies of the effect of sunlight on the strength and color of cotton fabrics, M. A. Grimes (*Texas Sta. Bul. 506 (1935), pp. 42, figs. 35*).—This bulletin reports a continuation by the same methods of the investigation reported in Bulletin 474 (E. S. R., 69, p. 316). The changes in strength and color of 85 additional fabrics were measured after each 25 hr. of exposure to sunlight until 500 hr. of exposure had been reached. The fabrics studied were

well-known brands of broadcloths, chambrays, ginghams, suitings, and nainsooks in white, blue, green, lavender, and pink. Chemical analyses of the size and finishes of the various fabrics were made by E. B. Middleton.

The data reported confirm in general those of the earlier investigation in showing that length of time of exposure of the fabrics had the greatest effect upon loss in strength, followed by temperature and relative humidity; that the losses in strength did not increase equally for all fabrics with increasing time of exposure; and that heavy fabrics lost less than light weight, and dyed fabrics, with the exception of pink, less than white. The color changes on exposure were not dependent upon the original color, but upon the nature of the dye and depth of dyeing, dark colors fading less than light. Guaranteed fabrics underwent less change in color than those not guaranteed, but fabrics guaranteed to be tub fast were not necessarily light fast.

"Care should be taken in purchasing fabrics which are to be laundered that they be guaranteed fast to both light and washing. Results of this study suggest that where light fastness is desirable, it is not impossible to attain, nor unreasonable to demand, a minimum fastness in dyed fabrics of 100 hr. of exposure to sunlight before fading is perceptible."

HOME MANAGEMENT AND EQUIPMENT

Home architecture, R. Newcomb and W. A. Foster (*New York: John Wiley & Sons. London: Chapman & Hall, 1932, pp. XIII+336, figs. 238*).—This is a handbook for the home designer based upon experience at the University of Illinois. It contains chapters on the history of shelter, the development of the house in America, the house site, house plans and planning, materials of construction, types of house construction, interior finish, home decoration and furnishing, plumbing, heating and ventilation, lighting, mechanical household appliances, ownership v. tenancy, financing the home, why employ an architect, building the new house, remodeling the house, the apartment house, the farmhouse, and the home grounds.

How to lay and maintain linoleum, C. H. Jefferson (*Michigan Sta. Quart. Bul., 17 (1935), No. 4, pp. 182–185*).—Practical information is given.

MISCELLANEOUS

Annual Report of the Massachusetts Agricultural Experiment Station, 1934, F. J. Sievers et al. (*Massachusetts Sta. Bul. 315 (1935), pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-eighth Annual Report of [Nebraska Station, 1934], W. W. Burr (*Nebraska Sta. Rpt. [1934], pp. 39*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

A report of the services rendered to the public by the Ohio Agricultural Experiment Station for the period January 23 to June 10, 1933, J. T. McClure (*Ohio Sta. Bimo. Bul. 174 (1935), pp. 103–107, figs. 2*).—Details are given of a survey of the number of services rendered to Ohio citizens and others by the station which disclosed a weekly average of approximately 9,300 for the period of January 23 to June 10, 1933.

Forty-seventh Annual Report [of Rhode Island Station, 1934], B. E. Gilbert et al. (*Rhode Island Sta. Rpt. [1934], pp. 50–94*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data (pp. 92, 93) are also included.

NOTES

Georgia Station.—Dr. J. L. Weimer, senior pathologist in forage crop diseases in the U. S. D. A. Bureau of Plant Industry, has been transferred from Riverside, Calif., to the station, beginning August 15, and will study the diseases of green manure crops, especially Austrian winter peas and vetches.

A community cannery erected of stone by FERA workers was equipped and opened for use at the Mountain Substation, near Blairsville, in July.

North Georgia farmers held their annual meeting and market day at this substation August 10, with about 4,000 in attendance. Farmers exhibited their products in competition for premiums supplied by merchants. The products were sold after the prizes were awarded.

Kentucky Station.—W. R. Roy has resigned as assistant chemist and has been succeeded by Malcolm Lyons. A. B. Poundstone has resigned as assistant in farm management.

Massachusetts College and Station.—The department of agricultural economics in the college is to be merged with the department of farm management as the department of agricultural economics and farm management. Dr. Adrian H. Lindsey has been appointed chairman of the new department, which will be a part of the division of agriculture. The department of economics, history, and sociology will be separated into departments of economics, headed by Dr. A. E. Cance, and history and sociology, under A. Anderson Mackimmie.

As a result of much interest on the part of nurserymen the State legislature during its last session provided a special fund for research in their field. The fund provides for the enlargement of laboratory and greenhouse facilities at the Waltham Field Station and also for the employment of an assistant research professor and a research assistant. R. T. Muller, formerly in commercial work, and C. J. Gilgut, a recent graduate of the college, have been appointed to these positions.

Lorian P. Jefferson, associated with the work of the college since 1912 and research assistant professor of agricultural economics in the station since 1920, has retired, effective July 31.

Minnesota Station.—Funds have been made available from university reserves for an office building and laboratory at the Southeast Substation at Waseca. The rapidly increasing amount of research work of a fundamental nature conducted there requires laboratory facilities for studies of the embryological development of young animals and facilities for handling the data growing out of the inbreeding investigations with swine. The substation is also the center for corn breeding activities in southern Minnesota and for sweetclover and sugar beet breeding investigations.

A comprehensive attack is being made on the control or eradication of certain noxious weeds which have become very troublesome in some parts of the State. Cooperative relations have been established with a farmer in southwestern Minnesota for investigations of methods of eradicating field bindweed. The attack includes black fallow over a 3-yr. period, fallow during the early part of the season, fallow by seeding to thickly growing smother crops, fallow to July 1 or later followed by fall rye with the process repeated for a 3-yr. period, and fallow during the fall of 1935 and the early part of 1936, then seeding to alfalfa for a more or less permanent stand. The investigations also

include attempted control through the use of various chemicals, accompanied by comprehensive studies of the effect of chemicals on plants on the root systems. The investigation is cooperative between the station and the State department of agriculture. Funds for the investigation were provided by special legislative appropriation.

Exercises were held on July 15 at Crookston in observance of the fortieth anniversary of the establishment of the Northwest Substation. The principal speaker was Dean and Director W. C. Coffey.

Mississippi College and Station.—Dr. C. H. Ragland has been appointed professor of horticulture and horticulturist, beginning July 1. Morris Benz, instructor and assistant in horticulture, has resigned and was succeeded September 1 by F. S. Batson. Dr. J. B. Edmond, associate professor of horticulture and associate horticulturist, resigned September 1 to accept a position in Clemson College.

On July 1, L. E. Long, research economist, resigned to accept a position with the regional resettlement office at Little Rock, Ark. R. L. Donahue has been added to the staff to assist in soils and forestry instruction and research.

Nebraska Station.—Appointments on July 1 include Russell T. Prescott as agricultural editor and L. L. Zook as superintendent of the North Platte Substation.

New Mexico College and Station.—President H. L. Kent has been given a year's leave of absence on account of ill health, with Dean H. M. Gardner as acting president. Richard V. Lott, professor of horticulture and horticulturist in the Mississippi College and Station, has been appointed associate horticulturist. A. B. Fite, also associate horticulturist, will devote half time to extension work in horticulture. Edith M. Lantz has been appointed research specialist in home economics, beginning August 1, vice Mary L. Greenwood resigned. H. N. Watenpaugh has been appointed associate agronomist vice C. L. Englehorn, resigned to accept a position with the U. S. D. A. Soil Conservation Service. On August 1 R. S. Stroud became assistant agronomist vice W. B. Morrow, Jr., resigned to engage in commercial work.

South Dakota College.—Dr. Ellwood C. Perisho, president from 1914 to 1919 and since 1921 professor of geology in Guilford College, died at Greensboro, N. C., August 14 at the age of 73 yr.

Wisconsin University and Station.—Dr. Alexander S. Alexander, head of the department of veterinary science from its establishment in 1903 to 1930 and subsequently professor emeritus, died July 12 at the age of 75 yr. Dr. Alexander was born in Glasgow and received his college and veterinary training in Scotland. He came to this country in 1882, farming in Iowa until 1886, serving as editor of the *Farmers' Review* of Chicago until 1890 and from then until 1907 as professor of veterinary hygiene, zootechnics, breeding and feeding for the Chicago Veterinary College. Associated with the work of the station from 1908 to 1910, he gave much attention to stallion improvement by legal registration and certification of superior sires. In recent years he was perhaps most widely known as a writer, publishing a number of books and contributing to many periodicals. One of his unique undertakings was the series of biographical articles entitled The Inquiring Mind and the Seeing Eye, appearing in *Better Crops with Plant Food* and dealing with a large number of outstanding leaders in agricultural science.

EXPERIMENT STATION RECORD

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EDITORIAL

FIFTIETH ANNIVERSARY OF THE KENTUCKY EXPERIMENT STATION

On September 25, 1885, the executive committee of the board of trustees of the A. and M. College of Kentucky, now the University of Kentucky, adopted a resolution which resulted in the establishment of the Kentucky Experiment Station. Fifty years to a day this action was fittingly commemorated by exercises on the university campus which blended appreciation of the past with recognition of enlarging opportunities and responsibilities in the future.

Following a morning of visits to the station's buildings and farm, the celebration itself was concentrated in a single afternoon session. The program was opened with a historical summary by Director T. P. Cooper entitled A Half Century in Retrospect. The farmer's viewpoint of the station was set forth with effectiveness and understanding by Hon. Perry B. Gaines, a member of the State Senate. There followed tributes to former Directors M. A. Scovell (1885–1912) and J. H. Kastle (1912–16), the unveiling of an oil painting of Director Cooper (1918–), and specific recognition of the work of three early members of the staff still in its service—Drs. A. M. Peter and H. Garman and Mr. H. E. Curtis. The closing address was given by Dean and Director F. B. Mumford of Missouri upon the general topic of Agriculture and Science.

As in many other States the establishment of the Kentucky Station was, in the words of Director Cooper, "without particular public acclaim or comment." The selection of Dr. Scovell as the first director implanted, however, the constructive ideals and standards which have characterized its activities. For some time he was practically alone in the work, but an assistant chemist was appointed in 1886. In the same year the legislature accepted the station by authorizing it to make official analyses and otherwise enforce the newly enacted fertilizer control law.

The passage of the Hatch Act brought enlarged funds and outlook. A farm of about 50 acres was purchased, a station building provided, and the scientific staff augmented to include in addition

to the director a chemist, two assistant chemists, an agriculturist, a farm superintendent, and a practical horticulturist. Three years after its organization the station had issued 16 bulletins covering such subjects as the effect of fertilizers on the quality of tobacco, corn fodder as a food for stock, and various aspects of crop fertilization. By 1892 the work in soils and dairying, which has since been carried on continuously, had been begun.

From meager beginnings the station has developed steadily. Its farm has been increased to approximately 600 acres. Two substations have been established, one with about 15,000 acres of land, as well as a series of widely distributed soil experiment fields. The staff has expanded to a point where the scientific and clerical workers number 100, taxing the capacity of the extensive buildings which have been provided. The annual income for the fiscal year 1935 was in excess of $342,000, of which over 74 percent was derived from non-Federal sources. The total number of publications in the regular bulletin series has reached 356, and this, as in other States, represents only a fraction of the entire published output.

The record of contributions to knowledge is similarly impressive. Space considerations of course preclude even an enumeration in these columns of the noteworthy findings of the half century, but mention may be made of the work on infectious abortion and other diseases in horses, forage poisoning and other ills of livestock, tobacco diseases, a study begun in 1912 of the necessity and function of a number of the minor chemical elements in the economy of plants and animals, soil conservation and improvement, and the many problems of farm management, economics, and sociology.

The anniversary celebration brought many messages of congratulation and appreciation. Among these was one from Dr. James T. Jardine, Chief of the Office of Experiment Stations, which summarized the whole matter in the following language: "Antedating the Hatch Act by more than a year, the station has developed steadily and consistently. It has been fortunate in generous State support, leadership of high character and long tenure of service, a capable and devoted personnel, and a program which has in general been a wise blending of the basic and the immediately useful. Its accomplishments have been many and its influence large and ever increasing."

The address of Dean Mumford also paid tribute to the work in Kentucky, but in the main dealt with the broader question of the service of the experiment stations as a group to American agriculture. He recalled the early failures of the agricultural colleges to meet the needs of their time until there was developed "a body of knowledge by the agricultural experiment stations which was to constitute the basis for all agricultural teaching." "I think", he went on to

say, "the agricultural experiment station is unique among scientific institutions in that it has not only discovered principles underlying the agricultural industry but it has very definitely developed a technic *for the application of the discoveries of science to the varied requirements* of the farm enterprise." In all this the central idea has been that of service to agriculture and to rural people.

"Now, after 50 years . . ., we are profiting from the results of the work of agricultural experiment stations in improved quality of farm products, reduced costs of production, improved varieties of plants and breeds and races of animals, in the prevention and control of animal and plant diseases, and have in the State agricultural experiment stations of the United States an organization of individuals of the highest scientific training available, equipped with apparatus, materials, and supplies which combined constitute one of the most important agencies for scientific research in the world. We may regard these organizations and institutions as representing one of the most effective instruments for the solution of peace-time problems. With the help of these institutions agriculture is prepared to meet the difficult problems of the future."

Looking toward this future, Dean Mumford drew special attention to the responsibilities and opportunities of the stations as factors in national planning. He deprecated the idea that science and research have been responsible for the current economic distress, stating that the farmers' difficulties under present conditions seem to be largely economic and governmental, and that while the stations may contribute to a knowledge of the workings of economic law and the influence of governmental policies it is not their province to "undertake to interfere with national and international economic policies and governmental activities." Nonetheless he visualized a permanent and increasing need for their services, pointing out that difficult and complex problems capable of solution by scientific research continue to arise, and concluding that "the possibilities of further contributions to agriculture by the experiment stations are incalculable."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

***A suggestion regarding the chemical formulae of compounds containing* hydrogen and oxygen isotopes**, R. A. Gortner (*Science, 79 (1934), No. 2044, pp. 203, 204; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 89*).—The author of this note, contributed from the Minnesota Experiment Station, proposes to designate and distinguish the hydrogen isotope of mass 2 by printing the symbol "H" in bold-faced type, the same convention to be adopted for the distinction of the oxygen isotope of mass 18, since this isotope of oxygen seems more common than the isotope of mass 17. For the hydrogen isotope of mass 3, should a symbol for such an isotope become needful, it is proposed that the symbol should be a bold-faced Old English H, the bold-faced Old English "O" being used to designate the less common oxygen isotope of mass 17.

The electrical conductivity of mixed salt solutions, A. K. Smith and R. A. Gortner (*Jour. Phys. Chem., 37 (1933), No. 1, pp. 79–86*).—Measurements of the electrical conductivity of a series of mixed solutions of strong electrolytes made at the Minnesota Experiment Station yielded, in place of such additive values as are postulated by the theory, values divergent from the theoretical to an extent greater than could be attributed to experimental errors and not in accordance with the Debye-Hückel theory. It is suggested that solvation of ions is probably a factor in the phenomena observed.

Electrokinetics.—XII, Interfacial energy and the molecular structure of organic compounds, II, Al_2O_3—organic liquid interfaces, O. G. Jensen and R. A. Gortner (*Jour. Phys. Chem., 36 (1932), No. 12, pp. 3138–3151, figs. 4; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 36*).—In the present installment of this serial contribution from the Minnesota Experiment Station (E. S. R., 68, p. 7), the authors report the determination of the streaming potential at aluminum oxide-organic liquid interfaces in the cases of 15 pure organic compounds. The ζ-potential, the electric moment of the double layer, and the degree of orientation were calculated for each case.

The streaming potential was found to increase in linear proportion to the pressure, as postulated by the theory.

A number of other observations and conclusions are recorded.

Electrokinetics.—XIII, The relation between streaming potential and the applied pressure [trans. title], H. B. Bull (*Kolloid Ztschr., 66 (1934), No. 1, pp. 20–22, figs. 2; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 64*).—It was found that the streaming potential method can be used for quantitative studies in electrokinetics; that there is a direct proportionality between the stream potential and the imposed pressure, and at zero pressure, zero potential; and that no polarization of metallic electrodes occurs if a quadrant electrometer be used as the null instrument.

[Arsenic content of soil and plants] (*Kentucky Sta. Rpt. 1934, pt. 1, p. 19*).—Data are reported for samples of soil, bluegrass, orchard grass, red clover, corn, and wheat.

[Iodine studies by the Kentucky Station] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 18, 19*).—Data are given on the iodine content of corn grain grown in different localities in the eastern coal field, of the blades, stalks, and grain of corn receiving graded doses of potassium iodide, and of cod- and halibut-liver oils.

The microbiological decomposition of the constituents of alfalfa hay, M. Phillips, M. J. Goss, E. A. Beavens, and L. H. James (*Jour. Agr. Res. [U. S.], 50 (1935), No. 9, pp. 761–775, figs. 2*).—An investigation of the microbiological decomposition of first and third cuttings of alfalfa hay occurring under aerobic conditions at 30° C. and at 55° and under anaerobic conditions at 30° was carried out at the Bureau of Chemistry and Soils, U. S. D. A.

The third-cutting material decomposed somewhat more rapidly than the first-cutting material. The greatest decomposition took place in the alcohol-benzene extractives, the hot and cold water extractives, the uronic acid anhydrides (the pectins and the polyuronide fraction generally), the crude protein (N×6.25), and the methoxyl in the plant material (unextracted). The pentosans decomposed somewhat more slowly, and the rate of decomposition of the Cross and Bevan cellulose and of the "pure" cellulose was still less. In general, the lignin was the most resistant of all the major plant constituents, although substantial losses of lignin occurred under aerobic and anaerobic conditions.

The possible role of lignin in the spontaneous ignition of hay is discussed. "Isolated lignin, that is, lignin prepared in the laboratory, is partly unsaturated, as is evident from the fact that it will absorb iodine from an iodine solution. It is conceivable that lignin freed from its combination with the carbohydrates by microbial activity may be even more unsaturated, as it is reasonable to suppose that lignin liberated under comparatively mild conditions would be less polymerized. Under suitable conditions this free lignin may readily absorb oxygen, with the evolution of heat. This rise in temperature will cause a degradation of the lignin such as is produced when this substance is subjected to dry distillation. Under these conditions lignin produces, in addition to other substances, a whole series of polyhydroxy phenols. These phenols are related to catechol and pyrogallol, which under suitable conditions absorb oxygen with avidity. This will bring about a further rise in temperature until the ignition point of the plant material is reached."

Physico-chemical studies on proteins, VII, VIII (*Cereal Chem., 10 (1933), No. 3, pp. 171–188; 11 (1934), No. 1, pp. 36–48, figs. 3; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 45, 63, 64*).—These two papers continue a serial contribution (E. S. R., 68, p. 10) from the Minnesota Experiment Station.

VII. *The peptization of gliadin by solutions of inorganic salts*, W. B. Sinclair and R. A. Gortner.—This installment of the series records a phase of the investigation in which were obtained data supporting the following conclusions:

"(1) The peptization of gliadin by neutral salt solutions appears to reflect the physical state of the protein gel, but not the organic chemical constitution, for the chemical composition of the various fractions is the same, within experimental error, as manifested by the nitrogen distribution (Hausmann values) and other analyses.

"(2) The treatment of gliadin with the neutral salt solutions which we have used does not produce any 'true hydrolysis', for no significant increase occurred in the free amino nitrogen, and no change in the free carboxyl groups.

"(3) The amount of protein (gliadin) which will be peptized by a particular salt solution depends upon both the concentration of the salt solution and the amount of gliadin which is present.

"(4) The lyotropic behavior of the ions on a gliadin-salt solution system is in the order I>Br>Cl.

"(5) When gliadin is treated repeatedly with molar KI or KBr solutions, there results an extremely 'soluble' fraction and an essentially 'insoluble' fraction. This difference in 'solubility' is accounted for as being due to a physical heterogeneity of the protein micelles and not to a chemical heterogeneity of mixed protein molecules."

VIII. *The rotatory dispersion of three gliadin preparations peptized by different solutions*, H. O. Wiles and R. A. Gortner.—Gliadin prepared by three methods was peptized by means of 10 percent and 70 percent ethyl alcohol, distilled water, N KI, and N KBr solutions. The optical rotatory power of these sols was determined at five light frequencies with the following results: $\nu=4.47\times10^{14}$, $[\alpha]^{25°C.}=-68.66°$; $\nu=4.81\times10^{14}$, $[\alpha]^{25°}=-80.54°$; $\nu=5.09\times0^{14}$, $[\alpha]^{25°}=-92.60°$; $\nu=5.49\times10^{14}$. $[\alpha]^{25°}=-111.98°$; and $\nu=6.10\times10^{14}$, $[\alpha]^{25°}=-144.85°$.

There was no difference in the rotatory dispersions of the three protein preparations which could be considered greater than the errors incident to the determinations.

Normal solutions of potassium chloride, sodium chloride, lithium chloride, and potassium sulfate did not peptize gliadin enough to yield a readable optical rotation.

The peptizing agent appeared to have no demonstrable effect on the rotatory dispersion; "If there is a lyotropic series effect it is less than the errors of the experimental method used."

Relative viscosities of wheat starches, C. E. MANGELS and C. H. BAILEY (*Indus. and Engin. Chem., 25 (1933), No. 4, pp. 456–460, figs. 7; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 57*).—Starches were prepared from hard spring, hard winter, soft winter, and durum wheat patent flours. Solutions of sodium salicylate, sodium thiocyanate, potassium thiocyanate, ammonium thiocyanate and sodium iodide, potassium iodide, sodium hydroxide, and urea were used to effect the swelling of suspensions of these starches in water. While the relationships between the different starches as to swelling capacity with different reagents were not uniformly maintained, the durum and winter wheat starches did in general show greater swelling power than the spring wheat starch. Chemical differences which cause variations in these physical properties of starch are believed to be probably complex in nature and to be possibly a function of the structure of the starch granules.

Relation of concentration to action of gelatinizing agents on starch, C. E. MANGELS and C. H. BAILEY (*Jour. Amer. Chem. Soc., 55 (1933), No. 5, pp. 1981–1988, figs. 6; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 57*).—The swelling or gelatinizing effect of aqueous solutions of sodium and potassium hydroxide, sodium salicylate, thiocyanates (sodium, potassium, and ammonium), iodides (sodium and potassium), bromides (sodium and potassium), chlorides (sodium, magnesium, calcium, and strontium), and urea on wheat starch was determined over a range of concentrations.

"Viscosity or swelling power of the reagents, in general, increased with concentration. Considerable variation in swelling or gelatinizing power of different reagents was noted. A Hofmeister series or lyotropic effect of anions was noted in the concentration-viscosity studies, as follows: Cl<B<I<CNS<salicylate<OH. The relations of different cations indicated some effect other than a lyotropic series. Microscopical examination indicates that viscosity at lower concentrations of reagents is due to jostling of swollen granules. As concentrations are increased, the granules burst and the amylopectin is dispersed, forming a true colloidal dispersion."

The gums of the cereal grains, M. E. FREEMAN and R. A. GORTNER (*Cereal Chem., 9 (1932), No. 5, pp. 506–518; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34,*

p. 30).—The authors extracted from durum, rye, and barley flours by means of a half-saturated ammonium sulfate solution gums containing neither hexoses nor hexose uronic acids and consisting largely of pentose polymers with some protein material. On hydrolysis the gums yielded xylose and arabinose, with the exception of one sample of durum gum which appeared to be a pure xylan. The protein constituent seemed probably to be adsorbed or "closely associated" with the gum.

These pentose gums formed typical colloidal sols with highly hydrated micelles. Viscometric data indicated that each gram of the gum in the sol state occupies about 9-cc volume; so that in the sol state the gum would seem necessarily to be hydrated to the extent of at least 800 percent.

Alpha-celluloses from different wood sources, R. A. Gortner and J. J. McNair (*Indus. and Engin. Chem., 25 (1933), No. 15, pp. 505–510, figs. 5; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 46*).—In the investigation here reported from the Minnesota Experiment Station, eight different woods were cooked with both sodium hydroxide and sodium sulfite, and the resulting pulps, after bleaching, were subjected to a series of successive alpha-cellulose determinations. Each subsequent alpha-cellulose treatment indicated a lowered apha-cellulose content. When plotted on coordinate paper, the percentages of alpha-cellulose in the pulp and pulp residues from successive treatments fell on approximately straight lines. The slope of these lines was characteristic of each pulp, indicating that each pulp has its own characteristic angle of degradation. The tangent of the angle of degradation is proposed as a criterion of the ease of peptization of the cellulose micelles in the pulp. It appeared that both the botanical source of the wood and the cooking procedure affect the tangent of the angle of degradation. The alpha-cellulose determination as used in the pulp and paper industry is considered an empirical procedure, in that two pulps may show identical initial alpha-cellulose contents but very different angles of degradation.

The cooking process, III–VII, S. I. Aronovsky and R. A. Gortner (*Indus. and Engin. Chem., 25 (1933), Nos. 8, pp. 305–310, figs. 4; 36, pp. 1260–1265, figs. 3; 40, pp. 1349–1354, figs. 3; 26 (1934), Nos. 1, pp. 61–65, figs. 3; 5, pp. 220–226, figs. 3; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 43, 44, 63, 64, 65*).—The five papers here dealt with continue a serial contribution not previously noted.[1] The experimental work in each case consisted in the treatment of aspen sawdust with solutions of various compounds, at temperatures of 170° and 186° C. and under various conditions of concentration and time period, and in the examination of the residual woods and liquors to determine the relative quantities of various reaction products, the degree of pulping effected, etc.

Yeast variability and its control in flour gassing power tests, R. M. Sandstedt and M. J. Blish (*Cereal Chem., 11 (1934), No. 4, pp. 368–383, figs. 6*).—An investigation carried out by the Nebraska Experiment Station resulted in the development of two forms of a simple and inexpensive manometric apparatus, and brought out the fact that differences in age or type of yeast constitute an important factor in manometric gassing power tests whenever the ratio of flour to yeast is small. "Unless yeast of assured constant properties is always available, this method requires that a standard flour be always included in a series of gassing power tests for the purpose of establishing a yeast 'correction factor.'" It was shown, however, that this difficulty may be overcome by using a small dough test in suitable pressure appara-

[1] Indus. and Engin. Chem., 22 (1930), Nos. 3, pp. 264–274, figs. 7; 9, pp. 941–945, figs. 3.

tus, and with only 3 percent of yeast, under which conditions consistent and concordant results were obtained when the same flour was tested with yeasts of different ages and types over a period of several months.

"Yeasts varying from 1 to 21 days in age gave closely agreeing results, provided the yeasts were kept stored at 6° to 8° C. By using a dough instead of a suspension, the variable factor of shaking is eliminated." It was further observed that "the maltase activity of bakers' compressed yeast rapidly deteriorates on storage. That this is not a serious factor causing variability in flour gassing power determinations, using the small quantities of yeast—as might be expected since maltose is the sugar produced by flour diastatic activity—is due to the presence in flour of an active maltase 'stimulant' whose nature is unknown to the writers. This 'stimulant' exists even in flour that has been rendered enzymatically inert and sugar-free by treatment with acid followed by extraction with strong alcohol."

The manometric apparatus described consists, in its simplest form, of a half-pint Mason fruit jar of the type having a flat lid held down on a rubber gasket ring by a threaded metal collar band, the lid proper being of metal with a wide tube soldered in at one side of the center and a tire valve similarly attached at the other side. A mercury manometer is set into the wide tube through rubber tubing serving as a gas-tight packing, and a valve permits releasing the pressure at will. A form of the apparatus in which aluminum cups with similarly constructed lids and fittings are substituted for the glass jars is also described.

Diastatic activity in suspensions and doughs, R. M. Sandstedt (*Cereal Chem., 11 (1934), No. 5, pp. 532–535*).—The author of this contribution from the Nebraska Experiment Station presents data showing that the diastatic activity of a yeast-fermented dough may be accurately determined by means of estimations of the extent of the diastasis under controlled conditions in aqueous suspensions of the flour. The data obtained are given, together with the calculated standard deviations and probable errors of single determination.

[Determination of nitrogen in soils and plant tissues] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 20, 21*).—Methods are outlined for total nitrogen in soils and plants and for soluble nitrogen in plant tissues.

A simplified Karns technic for the micro-estimation of iodine, H. von Kolnitz and R. E. Remington (*Indus. and Engin. Chem., Analyt. Ed., 5 (1933), No. 1, pp. 38, 39, fig. 1*).—The essential part of the simplified set-up described consists of a new form of burner for the combustion of the sample with the aid of two or four tangentially impinging jets of oxygen. The burner proper is enclosed by an inverted wide-mouthed Erlenmeyer flask. "The exit tube leading to the absorption train is of glass rather than metal, since the products of combustion are apt to be corrosive, and all brass surfaces exposed in the combustion chamber and water-seal cup are given a coating of nitrocellulose lacquer, it having been found that copper in the washings may interfere in the analysis."

Samples of from 25 to 50 g of dried milk or dried vegetable matter packed into a kind of sausage casing a little less than 1 in. in diameter could be burned satisfactorily in one operation. The type of sausage casing specified appears not to have contained iodine enough to interfere with the determination. No electrical dust precipitator was found necessary, and an adequate absorption was obtained by the use of but two wash bottles (either of the Friedrich or of the Milligan type) in series.

From 98.7 to 108.8 percent recoveries of the iodine content of samples containing from a little less than 30 to about 115 μg of the element were obtained.

The construction of the burner is shown in a drawing.

A simple volumetric method for determination of fat in blood plasma, N. N. ALLEN (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 8, pp. 991–993, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 75, 76*).—The following method was found to be easily and quickly carried out:

A 3-cc sample of blood plasma is introduced into a specially designed test bottle, and 5 cc of an alkali test reagent developed by Petersen and Herreid (E. S. R., 63, p. 506) is added. The mixture is digested in a water bath at from 180° to 185° F. for 20 min., after which the test bottles are centrifuged for 5 min. A speed of 800 r. p. m. in a centrifuge with a diameter of 18 in. has been found to be sufficient. Hot water is added to bring the sample up to the base of the reading neck and the sample centrifuged for 2 min. Water is then added to bring the fat column into the reading neck and the sample again centrifuged for 2 min. It is then removed to a water bath at 140° for 5 min. before reading. The length of the fat column is measured by means of calipers, and a calibration factor is applied to convert the reading to milligrams per 100 cc.

Comparison of Jenner-Kay and Bodansky methods for determining phosphatase in plasma and serum, L. S. PALMER and J. W. NELSON (*Soc. Expt. Biol. and Med. Proc., 31 (1934), No. 9, pp. 1070–1073; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 75*).—In this investigation the phosphatase activity of the blood of cows was found to be estimated with equal accuracy by the two procedures when two bloods with widely different determined activity are mixed in definite proportions, but the ratio of Jenner-Kay to Bodansky phosphatase units ranges rather widely for different samples of blood.

Vitamin A determination: Relation between the biological, chemical, and physical methods of test, K. C. LATHBURY (*Biochem. Jour., 28 (1934), No. 6, pp. 2254–2264, figs. 5*).—This investigation, conducted in the Physiological Laboratories of The British Drug Houses, Ltd., was undertaken because of doubt cast by some investigators, notably Coward et al (E. S. R., 69, p. 630), on the value of the Carr-Price color test, which is used by the British Drug Houses in describing the potency of their products. Six samples of crude liver oils or concentrates and a sample of the international standard were compared for their content of vitamin A by feeding experiments on rats, the Carr-Price test, and the spectrophotometric test.

The results obtained, which are presented in detail, are considered by the author to be consistent. "The limited number of cod-liver oils that we have examined have shown a constant ratio to the Carr-Price figures, using the Smith and Hazley method, and also to those obtained by the spectrophotometric method. Especially we have found that purified vitamin A concentrates give a constant ratio between the results of the biological, chemical, and physical methods, and there seems to be no reason to doubt that the three are interchangeable."

Observations on the estimation of ascorbic acid, M. L. GRAHAM and E. W. MCHENRY (*Canad. Chem. and Metall., 19 (1935), No. 5, p. 132*).—In this summary of measurements by a modification of the titration procedure of Birch, Harris, and Ray of the ascorbic acid content of Ontario fruits and vegetables, it is noted that certain tissues such as lettuce gave lower values than would be expected from biological assay and that certain vegetables (cauliflower, carrots, and parsnips) gave higher values after short periods of heating than in the raw state. The low values are attributed to the presence of reversibly oxidized ascorbic acid which is not measured by simple titration, but which is biologically active, and the increased values after heating to the liberation of free ascorbic acid from an esterlike compound which is soluble in water and insoluble in trichloroacetic acid solution.

"In some vegetables, then, ascorbic acid exists in three forms: Free and reduced, reversibly oxidized, and bound in an esterlike compound. Only the first form is estimated when these vegetables are extracted with trichloroacetic acid and the extract titrated against phenolindophenol. The total amount of ascorbic acid present is appreciably greater than that which exists in the free, unoxidized form."

Estimation of ascorbic acid by titration, E. W. McHenry and M. L. Graham (*Nature* [*London*], *135* (*1935*), *No. 3421, pp. 871, 872*).—Attention is called to the observations noted above, and an extension of the tests on heated food materials is reported. Ascorbic acid determinations on two of the vegetables at regular intervals during heat treatment showed that the increase in titration value against phenolindophenol is very rapid at first, reaching a maximum within 5 min. if oxidation is retarded by the addition of cyanide or by heating in an atmosphere of nitrogen or carbon dioxide. In the case of cauliflower this increase amounted to 60 percent of the value of the raw vegetable. As the heat treatment is continued, the increase is followed by a gradual decrease.

It is noted that, unlike certain plant tissues in which the ascorbic acid may occur in the three forms noted above, "bovine adrenal tissue contains little bound ascorbic acid and none of the reversibly oxidized compound. Acid fruits, such as lemons, oranges, and tomatoes, resemble adrenal tissue in containing only free ascorbic acid."

A new method for the determination of ascorbic acid (vitamin C) [trans. title], E. Martini and A. Bonsignore (*Biochem. Ztschr.*, *273* (*1934*), *No. 1–3, pp. 170–177, fig. 1*).—The method described involves titration of practically neutralized trichloroacetic acid extracts of the material with a 1:10,000 aqueous solution of methylene blue. This is converted to the leuco compound by ascorbic acid, the amount reduced being molecularly equivalent to the ascorbic acid. Sodium thiosulfate is added to prevent reoxidation of the leuco derivative.

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A study of certain climatic factors that may affect crop yields in the high plains of Oklahoma, H. A. Daniel ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 57* (*1935*), *pp. 3–10, figs. 5*).—In a study of seasonal evaporation; mean maximum, mean minimum, and mean temperature; average daily wind velocity; and total rainfall at Goodwell, Okla., there was found to be a negative correlation between seasonal evaporation, as measured by an open evaporation tank, and the yield of wheat grown on fallow soil, and very little correlation with yield of milo grain grown on heavy silt loam soil. "Although the data reported did not show a very close relation between crop yields and seasonal rainfall, the 6 years' yield data obtained from land continuously planted to wheat seemed to be more closely related with this factor than either the yield from milo or wheat grown on fallowed soil. Data were obtained which showed that the mean annual temperature was gradually increasing, and that the total rainfall from 1930–34 was 2.46 in. less than the average from 1915–19 at Goodwell, Okla. Very little change was found in the wind velocity during the last 10 years."

SOILS—FERTILIZERS

The universal soil testing system, M. F. Morgan (*Connecticut* [*New Haven*] *Sta. Bul. 372* (*1935*), *pp. 453–483, pls. 8*).—The author has thoroughly revised the methods suggested in Bulletin 333 (E. S. R., 67, p. 105), adding various

tests including a test for available soil potassium. "The distinguishing characteristic of this scheme of testing is the employment of a highly buffered mixture of acetic acid and sodium acetate for the extraction of the soil sample. All of the significant tests are conducted on portions of this extract; hence great speed and economy of operation are provided."

The bulletin contains color charts, from which may be read approximations of the pounds in 1 acre 7 in. deep, for use with the tests for ammonia nitrogen, nitrate nitrogen, phosphorus, potassium, calcium, magnesium, aluminum, and manganese. Concise but complete directions for preparing the reagents, choosing the necessary apparatus, carrying out the tests, and reading the results from the charts are given, together with formulas for the preparation of standards which may be used to check the charts or in place of them. The interpretation of the results obtained and the use of the tests for estimating the mineral nutrient contents of plant tissues are also briefly discussed.

[Soil Survey Reports, 1930 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 22, pp. 34, pls. 2, figs. 2, map 1; 23, pp. 59, pls. 2, figs. 4, map 1; 24, pp. 37, figs. 2, map 1; 25, pp. 51, figs. 2, map 1; 26, pp. 37, figs. 2, map 1; 27, pp. 32, figs. 2, map 1*).—The reports here noted were prepared with the cooperation of the University of Idaho, the Kentucky, Oklahoma, and Texas Experiment Stations, the University of Nebraska, and the Georgia State College of Agriculture.

No. 22. *Soil survey of Benewah County, Idaho*, E. N. Poulson and K. B. Platt.—The 503,040 acres included in Benewah County, northwestern Idaho, consist mainly of mountainous and semimountainous lands of value principally for forestry. Of the total area, 63.5 percent was found to be rough mountainous lands. Santa silt loam, totaling 10.2 percent of the area surveyed, was the most extensive of the 14 types found and classified as 12 series. Mechanical analyses and pH determinations of several soils of the county are reported.

No. 23. *Soil survey of Mercer County, Kentucky*, H. W. Higbee et al.—Mercer County consists of 161,920 acres in east-central Kentucky, of which area the western part "is dissected into a dendritic system of narrow sharp-topped ridges and V-shaped valleys," with the eastern part mostly less rough. The drainage is from good to erosive.

The county was found to contain 14 series of soils, inclusive of 19 types. Eden stony clay loam, which occupies 17.9 percent of the county and is the most extensive classified soil, "is utilized chiefly as grazing land," and it is noted that, "in general, cultivated crops should not be grown unless every effort is made to prevent erosion." Eden silty clay loam occupies 13.9 percent, and Maury silt loam, one of the better agricultural soils, 16.2 percent. Mechanical and chemical analyses of several soils of the county are included, and a discussion of agricultural methods and management, by P. E. Karraker, is appended.

No. 24. *Soil survey of Tillman County, Oklahoma*, A. W. Goke et al.—Tillman County, southwestern Oklahoma, covers 576,000 acres and forms part of a plain sloping slightly southward. Available moisture is the factor limiting crop production.

The soils mapped and described in the present report are of 21 types, grouped into 11 series. Tillman silt loam covering 11.8 percent of the area is the most extensive type. Enterprise loamy very fine sand follows with 10.5 percent. Agricultural methods and soil management are discussed by W. C. Boatright, and mechanical analyses and pH determinations of some of the soils of the county are included.

No. 25. *Soil survey of Knox County, Nebraska*, F. A. Hayes et al.—Knox County, in northeastern Nebraska, comprises an area of 716,160 acres, of which about 90 percent is upland, the remainder alluvial.

The soils were found to constitute 18 series, in which are included 40 types. The more extensive soils are Moody silt loam, found to form 14.5 percent of the soils of the county, and Dickinson fine sandy loam, 12.4 percent. Mechanical analyses and pH determinations of several soils of the county are included.

No. 26. *Soil survey of Jefferson County, Georgia*, R. T. A. Burke et al.—Jefferson County is an area of 340,480 acres of a flat to undulating plain in east-central Georgia. Sinks and the swampy lands, which amount to over one-tenth of the county, together with "some of the flatter upland areas, the soils on the first bottoms, and those on the flatter parts of the terraces", are ill drained, but the remainder of the county has good drainage.

Norfolk sandy loam covers 12.0 percent of the county; Magnolia sandy loam, a further 15.7 percent. The report maps and describes a total of 24 types, classified as 14 series, as well as unclassified meadow land 3.1 percent, and 10.3 percent in swamp. Mechanical analyses and pH determinations of 4 soils are included.

No. 27. *Soil survey of Randall County, Texas*, E. H. Templin and T. C. Reitch.—Randall County covers 588,800 acres of northwestern Texas. "Of the total area, about 82 percent consists of smooth lands of the High Plains and 18 percent is rough land of the canyons and valleys of Palodura Creek and its tributaries."

In all, 8 series of soils, inclusive of 15 types, were found. Pullman silty clay loam, known locally as "High Plains tight land", occupies 64.8 percent of the county. A further 7.4 percent is listed as rough broken land. Mechanical analyses of 3 soils are included.

[**Soil Survey Reports, 1931 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1931, Nos. 8, pp. 30, figs. 2, map 1; 9, pp. 41, figs. 2, map 1*).—The surveys here noted were made with the cooperation of the Kansas and Iowa Experiment Stations, respectively.

No. 8. *Soil survey of Woodson County, Kansas*, M. H. Layton and C. E. Dornberger.—Woodson County, southeastern Kansas, occupies an area of 321,920 acres and is located in a plain having an undulating to rolling surface. Drainage is provided by the Neosho and Verdigris Rivers and their tributaries.

Parsons silt loam covers 29.2 percent of the county area, Bates stony loam 13.7 percent, and Woodson silt loam 11.5 percent. In all, 10 series inclusive of 19 types were mapped and are here described. Data showing the increased yield of alfalfa from fertilizers on experiment fields in the area and pH determinations on Woodson silt loam and Parsons silt loam are included.

No. 9. *Soil survey of Monroe County, Iowa*, C. L. Orrben and W. E. Tharp.—Monroe County is located in southeastern Iowa, in a region the surface features of which have been formed by the dissection of a level plain by streams which have established very effective natural drainage. The area of the county is 276,480 acres.

The report maps and describes 17 soil types of 15 series. The more important soils are Shelby silt loam, which covers 23.4 percent of the area surveyed; Grundy silt loam, which was found to the extent of 21.1 percent; Lindley silt loam, 14.4 percent; Weller silt loam, 13.1 percent; and Wabash silt loam, 10.7 percent. Data are also included showing results of fertilizer tests and pH determinations.

The floor of some northern Minnesota forests, F. J. Alway and P. R. McMiller (*Amer. Soil Survey Assoc. Rpt., 13 (1932), pp. 11–18; abs. in Minne-*

sota Sta. [Bien.] Rpt. 1933–34, pp. 49, 50).—The authors examined somewhat more than 200 samples representative of 27 soil types found in scattered groups of townships in northern Minnesota.

The volatile matter ranged from 9 to 87 percent, the pH from 3.8 to 7.2, the nitrogen in the organic matter from 1.1 to 3.3 percent, and the lime from 0.7 to 8.1 percent. The phosphoric acid was determined in some of the samples, falling, in about half, between 0.1 and 0.3 percent, in a third between 0.31 and 0.5 percent, and in the remainder exceeding 0.5 percent. The organic matter in the forest floor ranged from 5 to 31 tons per acre, the nitrogen from 196 to 1,144 lb., and the lime from 256 to 2,411 lb.

The data are reported in a form designed to show the relation of the composition and the reaction of the forest floor to the texture and natural drainage of the soils.

Interrelationships of soil and forest cover on Star Island, Minnesota, F. J. ALWAY and P. R. MCMILLER *(Soil Sci., 36 (1933), No. 4, pp. 281–295, pl. 1, figs. 3; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 50).*—On a small sandy island in a northern Minnesota lake four forest types were found by the authors of this contribution from the Minnesota Experiment Station in a practically virgin condition, namely, jack pine, Norway pine, white pine, and maple-basswood.

The soil was examined to a depth of from 7 to 12 ft. at 40 places where the surface is from 15 to 46 ft. above the water in the lake and only coarse textured material is found. No differences in the soil were found to account for the presence of the maple-basswood type on the sandy soil. Under all four forest types the soil profile was similar, except that in the surface 6 in. of the maple-basswood areas there was much more organic matter than under the jack and Norway pines; the acidity, in general, being somewhat lower. In the second, third, and fourth feet there were no characteristic differences in acidity, but at greater depths the acidity was lower on the maple-basswood areas, and on these carbonates were usually found nearer the surface, at from 4 to 7.3 ft.

The forest floor, however, was found to show more characteristic differences, "that on the maple-basswood areas being much less acid, much richer in lime, and somewhat richer in nitrogen than that on the jack and Norway pine areas. Compared with the underlying surface 3 in. of soil the forest floor on the maple-basswood areas is almost everywhere the less acid, whereas on the jack and Norway pine areas it is usually the more acid. The marked differences in the character of the forest floor and smaller differences in the soil may be considered the effect of the forest types still occupying the different parts of the island.

"In the character of both forest floor and soil the white pine areas occupy a position between the jack and Norway pine on one side and the maple-basswood on the other."

Composition of the forest floor layers under different forest types on the same soil type, F. J. ALWAY, J. KITTREDGE, and W. J. METHLEY *(Soil Sci., 36 (1933), No. 5, pp. 387–398, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 50, 51).*—In an investigation reported from the Minnesota Experiment Station litter, duff, leaf mold, and freshly fallen leaves were collected from representative areas of Norway pine, white pine, and sugar maple-basswood forest on Star Island, Minn., described in the foregoing abstract, and from a nearby jack pine area, all on the same sandy soil type. There was evidence that fire had not appreciably affected the forest floor on any of the areas for at least 60 yr. Determinations of ash, lime, nitrogen, and acidity were made.

"With all four types a progressive increase is found in the percentages of ash, lime, and nitrogen, together with a decrease in acidity, on passing from

the litter to the duff and from the duff to the leaf mold. The differences between the jack pine and the Norway pine types are small, but between these and the maple-basswood type they are marked. These differences are to be attributed to the influence of the respective forest types and their associated vegetation, as the mineral soil under all four forest types is similar. In the maple-basswood area the litter, duff, and leaf mold each carry about five times the percentage of lime and one and a half times to twice as much nitrogen as is found on the jack and Norway pine areas. In the white pine floor the values for lime and nitrogen in each of the layers lie between those for the Norway or jack pine and the maple-basswood, but decidedly nearer the former.

"In acidity, differences between forest types are negligible in the freshly fallen leaves and small in the litter, but the duff and leaf mold of the maple-basswood are far less acid than the same layers of the Norway and jack pine, while the white pine occupies an intermediate position. Although in general the acidity of the three forest floor layers varies inversely as the lime content, with the maple-basswood, in passing from litter to duff and from duff to leaf mold, the acidity decreases much more rapidly than the lime increases. In contrast the maple-basswood leaves are about as acid as the needles of the pines, although they are about three times as rich in lime. Phosphoric acid, potash, and sulfur are much the highest in the layers of the hardwood forest."

The freshly fallen leaves were found to be similar in composition to those of the underlying litter. Those of the maple and basswood contained much more ash than the pine needles and twice as much lime, but were not much richer in nitrogen. The leaves of white pine were similar in composition to those of the Norway pine.

Distribution of volatile matter, lime, and nitrogen among litter, duff, and leaf mold under different forest types, F. J. Alway, W. J. Methley, and O. R. Younge (*Soil Sci., 36 (1933), No. 5, pp. 399–407, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 51, 52*).—The samples examined in the investigations reported in the present contribution from the Minnesota Experiment Station were taken from the forest areas named in the two preceding abstracts and from an additional smaller jack pine area on Star Island.

"The maple-basswood had the least litter and the least duff but the most leaf mold, about 1 ton, 4 tons, and 25 tons per acre, respectively, of oven-dry matter. The white pine had more duff but less leaf mold, whereas the Norway and jack pines were similar, having a smaller total amount with a still lower proportion of this in the leaf mold. The relative amounts of volatile matter were much the same as those of dry matter.

"The largest amounts of both lime and nitrogen were found in the forest floor of the maple-basswood, 2,139 lb. per acre of CaO and 963 of nitrogen. The white pine was next highest, with 40 percent as much lime and 75 percent as much nitrogen, whereas the jack and Norway pine floors were lower, carrying only 10 to 20 percent as much lime and 22 to 45 percent as much nitrogen.

"The percentage of nitrogen in the surface 2.75 in. of the underlying mineral soil was only from one-seventh to one-nineteenth as high as that in the forest floor, but the weight per unit area was in all cases greater except under the white pine. The weight of lime per unit area soluble in aqua regia was greater in this surface layer than in the forest floor, in the case of all the forest types, that on the jack pine areas being four times as high.

"The percentages of lime and nitrogen in the undergrowth of the different forest types were much alike, and the amount in each ranged only from 2 to 17 lb. per acre."

North Carolina soils evaluated for crop growth, C. B. WILLIAMS and J. F. LUTZ (*North Carolina Sta. Agron. Inform. Circ. 94 (1935), pp. [3]+123+[9]*).—This mimeographed circular is intended to give the farmers of the State information as to the relative adaptability of some of the more important soils to 28 crops by means of soil ratings based on a scale of 10. The circular is divided into three parts under the following titles: Soil types of North Carolina best suited for different crops (fertilized); rating of soil types for growth of crops, arranged in groups of soil provinces—North Carolina; and various classes of soils in North Carolina and their special crop adaptations.

Comparative data for three Coastal Plain soils for soil characteristics and plant growth, J. B. HESTER and F. A. SHELTON (*Virginia Truck Sta. Bul. 84 (1934), pp. 1155–1193*).—Three virgin soils (a Norfolk fine sand, a Bladen sandy loam, and a Portsmouth loamy fine sand) were investigated for soil characteristics in the laboratory and for plant response in the greenhouse. The soils were found to be of a very low percentage of saturation with bases, the Portsmouth soil having the lowest percentage of saturation and the highest acidity, followed by the Bladen and the Norfolk. The base exchange capacity of the humus content of the soils was found to vary with the conditions under which it was formed. The cation exchange capacity of the humus of the Portsmouth soil was the highest because it had been less influenced by aluminum and iron complexes.

"The ultimate pH values of the soils were in ascending order: Portsmouth 3.5, Bladen 3.6, and Norfolk 4.7. The lowest pH value for satisfactory growth of beets on the Portsmouth series was pH 4.8; on the Bladen series, 4.9; and on the Norfolk, 5.7. At these reactions there was about the same percentage saturation with calcium on the three soils. For strawberries the lowest reaction for good growth was pH 4.6, 4.9, and 5.8; for spinach 5.0, 5.4, and between 5.5 and 6.0, respectively, for the Portsmouth, Bladen, and Norfolk soils. The point at which growth was markedly retarded was correlated with the appearance of aluminum in the drainage water. The addition of organic matter to the Bladen and Norfolk soils suppressed the solubility of aluminum at low pH values and enabled crops to grow more satisfactorily than on the untreated soils. The organic matter added to the Norfolk soil also increased the availability of phosphorus at the pH value of optimum growth, and likewise plants grew better on the treated than on the untreated soil.

"The composition of the soil solution influenced the composition of the plant. The variation in lime content of the soil affected the availability of plant nutrients as measured by the ions absorbed by the plant and leached from the soil. The Bladen soil, because of a wide carbon: nitrogen ratio, showed the lowest availability for nitrogen. All soils showed high power for fixing phosphorus in an unavailable state for vegetable crops, the order for fixation being Norfolk, Bladen, and Portsmouth. The Bladen soil showed the highest power for fixing potash in a state unavailable to vegetable crops."

The question of mobility and availability of magnesium in the three soils is discussed from the standpoint of soil reaction and soil type.

A preliminary report of the chemical and mechanical analyses of dust deposited by wind at Goodwell, Oklahoma, C. L. FLY (*[Oklahoma] Panhandle Sta., Panhandle Bul. 57 (1935), pp. 11–15*).—Mechanical analysis of dust deposited by wind showed that it was much higher in silt and lower in sand than an ordinary Richfield silt loam soil. All particles of dust were less than 0.15 mm in diameter, analyzing 14.3 percent very fine sand, 62.5 percent silt, and 23.2 percent clay.

Dust samples were found to vary from neutral to slightly basic in reaction and to be very much higher in combustible matter, bicarbonates, total nitrogen, easily soluble phosphorus, base-exchange calcium, and total soluble salts than a Richfield silt loam soil or a drift soil.

Certain of the data obtained led to the conclusion that wind erosion may seriously impair the fertility of a soil by carrying away the lighter and more fertile components. Although soil removed from one field may be deposited upon another, "the loss of fertility through fine dust which may travel for hundreds of miles is irreparable and costly. Shallow-phase soils will be the first to lose their fertility and value as crop producers. Deep, heavy soils, while suffering no great immediate change in fertility, may be expected over a period of years to be gradually depleted to total plant food reserve. The author is convinced that not as much soil will be returned to a given field as is carried away by winds, and that a steady drain upon the fertility of the high plains soils will continue until wind erosion is checked by protective vegetative covering and proper tillage practices."

A critical study of the methods for measuring oxidation-reduction potentials of soils, with special reference to orchard soils, M. PEECH and L. P. BATJER (*[New York] Cornell Sta. Bul. 625 (1935), pp. 23, figs. 10*).—The authors describe a method of measuring the oxidation-reduction potentials of soils suspended in N/10 H_2SO_4 by means of a vacuum-tube potentiometer. The method of suspending the soils in N/10 H_2SO_4 for redox measurements was found to have the following advantages over the soil-water-suspension method: (1) The microbiological activity is stopped in this concentration of acid, and hence no reduction of the soil can take place between the time of sampling and the time when the measurements are made. (2) Although many soils showed an apparent oxidation on standing regardless of the pH value of the suspension medium, a number of those investigated were found to be less susceptible to oxidation in the acid suspension. (3) The time necessary to reach a stable, reproducible electrode potential in acid suspensions was shown to be much shorter than that required in soil-water suspensions. (4) It was shown that the final value of E_h obtained in acid suspensions is not affected by the previous reading of the electrode, and consequently the oxidation-reduction potentials are more accurately reproducible.

In an experiment carried out to determine the proper time of sampling the soil in the spring, it was found that no appreciable reduction of the soil takes place until the temperature of the soil has increased to 55° F., approximately.

Rate of decomposition of organic matter in Norfolk sand as measured by the formation of carbon dioxide and nitrates, C. E. BELL (*Jour. Agr. Res. [U. S.], 50 (1935), No. 9, pp. 717–730, figs. 10*).—According to results obtained at the Florida Experiment Station, "the CO_2 evolved from the soils treated with legumes exceeded for the first 27 days the CO_2 evolved from the soil treated with Natal grass or manure. In every instance the maximum quantity of CO_2 was evolved at the beginning of the experiment and gradually diminished thereafter. There was an apparent constant rate of decomposition, as measured by CO_2 evolution, at the end of about 4 mo., when the amount formed in the treated soil was approximately equal to that formed in the virgin soil. The period of maximum CO_2 evolution in the case of the soils kept in the greenhouse occurred during the first 2 mo. of the experiment, whereas that for soils kept under field conditions was formed during the first 30 days. More CO_2 was evolved from the soils bearing citrus seedlings than from those kept fallow, and the greatest quantity of CO_2 was produced from the soil kept in the greenhouse. The addition of inorganic nitrogenous fertilizers increased the amount

of CO_2 given off from all soils bearing citrus seedlings, but this increase was possibly due to the increased root growth. There was no evidence of any loss of nitrogen from these soils through volatilization of ammonia. In the soils treated with Natal grass there appeared to be considerable nitrogen assimilation. A striking difference in the availability of the nitrogen in the organic materials under different conditions was noted. A greater percentage of the nitrogen in the organic materials was made available under greenhouse conditions, and this greater availability was distributed throughout the period of the experiment."

Effect of annual grass fires on organic matter and other constituents of virgin longleaf pine soils, S. W. Greene (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 10, pp. 809–822*).—In an 8-yr. comparison at the McNeill Substation in cooperation with the Mississippi Experiment Station of annual grass burning with complete fire protection in a tract of rolling longleaf pineland (sandy loam soil) there was found in the burned-over soil 1.6 times as much organic matter and 1.5 times as much nitrogen as in the soils completely protected from fire.

"Whether plant debris was burned in place on top of the soil or was left to rot in place on top of the soil apparently had no direct effect on either the organic-matter content or the nitrogen content of the soil. In both cases, the organic matter and nitrogen above ground were largely lost to the soil and the nonvolatile mineral fertilizing elements were returned, leaving organic matter and nitrogen increases to be influenced by the amount and composition of decaying plant roots. . . .

"The quantity of forage growth on the ungrazed burned areas at the end of the period was more than double that on the unburned areas. The additional quantities of plant roots decaying in the soil on the burned areas apparently account for the increase in soil organic matter to a depth of 6 in. The increased growth on the burned areas of native legumes, their ability to take nitrogen from the air, and the additional growth of other plants which take up soluble forms of nitrogen and prevent leaching apparently account for the increased amount of soil nitrogen. The increase in organic matter and nitrogen on the burned areas was reflected in the higher crude-protein content of the principal forage grasses that grew on burned areas as contrasted with the unburned.

"Annual burning returned the nonvolatile fertilizing elements to the soil immediately. This was shown in the analyses of both the soil and the forage growth. The increased organic matter and nitrogen in the burned-over soils was reflected in an increased number of soil micro-organisms. The accumulation of plant debris on top of the soil did not materially increase the soil moisture in spite of the fact that much greater amounts of water were required to support the extra forage growth on the burned-over soils. Organic matter on top of the soil absorbs a portion of the rainfall, which is thus prevented from reaching the soil for the use of growing plants."

Nutrient value of the phosphorus in calcined phosphate as determined by growth of plants in greenhouse experiments, K. D. Jacob, R. P. Bartholomew, B. E. Brown, W. H. Pierre, F. R. Reid, and J. W. Tidmore (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 10, pp. 837–848*).—In a series of experiments with calcined phosphate conducted by the Bureaus of Chemistry and Soils and Plant Industry, U. S. D. A., in cooperation with the Alabama, Arkansas, and West Virginia Experiment Stations, on Cecil clay, Clarksville silt loam, Norfolk loamy fine sand, and Dekalb silt loam soils, pH values from 4.8 to 6.23, compari-

son was made with superphosphate, dicalcium phosphate, and ground phosphate rock by means of cabbage, millet, and Sudan grass as test plants.

"The nutrient value of calcined phosphate was related, more or less directly, to the citrate solubility of the phosphorus, which depended on the amount of fluorine volatilized from the rock during calcination. Volatilization of the fluorine in quantity less than that (about 63 percent of the total fluorine content of the phosphate rock) corresponding to the fluorine in excess of the second atom of fluorine in the fluorapatite equivalent of the total phosphorus decreased the citrate solubility of the phosphorus, as compared with that of the phosphorus in the original phosphate rock, and markedly reduced the nutrient value of the phosphorus, as indicated by the plant growth and the absorption of phosphorus. Volatilization of 64 percent or more of the fluorine caused a progressive and pronounced increase in the citrate solubility and nutrient value of the calcined phosphate. In general, calcined phosphates showing citrate solubilities of approximately 78 percent or higher (corresponding to the volatilization of 93 percent or more of the total fluorine content of the original phosphate rock) were as efficient sources of phosphorus for plant growth as were equivalent quantities of total phosphorus from either superphosphate or dicalcium phosphate. In general, the effect of the phosphates in increasing the dry weight of cabbage, millet, and Sudan grass was related fairly closely to their effect in increasing the quantity of phosphorus absorbed by the plants."

Certain rarer elements in soils and fertilizers and their role in plant growth, R. S. Young (*[New York] Cornell Sta. Mem. 174 (1935), pp. 70*).—Arsenic, barium, boron, bromine, chromium, copper, iodine, lead, manganese, strontium, titanium, and vanadium were shown to be present in determinable quantities in 53 fertilizers representing the major types used in agricultural practice, while traces of lithium, tin, and zinc were detected in a few samples.

Methods for the determination of many of these elements in fertilizers were provided by suitably modifying existing analytical procedures for rock analysis.

The effect of the addition of copper, manganese, boron, and zinc, in quantities equal to the highest found in samples of fertilizers examined, to a synthetic fertilizer containing pure salts of nitrogen, phosphorus, and potassium on the growth of oats on two soil types was investigated, together with that of adding each of 35 rarer elements to Merrimac coarse sandy loam in five concentrations—2,000, 500, 100, 10, and 0.1 p. p. m.—on the growth of timothy receiving a pure fertilizer mixture of nitrogen, phosphorus, and potassium. Both on Merrimac coarse sandy loam and on Honeoye silt loam, copper, manganese, zinc, and boron, added to a fertilizer composed of pure compounds of nitrogen, phosphorus, and potassium, produced slight increases in the yield; and "when copper, manganese, and zinc were added to the soil in considerably higher amounts, and boron in slightly larger quantity, than the highest concentration found in the fertilizers examined, further slight increases in yield were noted on both soil types."

Molybdenum was found to be stimulating to timothy at the highest concentration employed, while antimony, barium, bismuth, bromine, cerium, manganese, strontium, tungsten, uranium, and yttrium were beneficial at 500 p. p. m. The incorporation with the soil of aluminum, cadmium, copper, fluorine, lanthanum, lead, mercury, tin, and zinc at the rate of 100 p. p. m. resulted in an increased growth of timothy, while a reduction in concentration to 10 p. p. m. gave stimulation with arsenic, beryllium, chromium, iodine, lithium, selenium, thorium, titanium, vanadium, and zirconium. Boron, nickel, and thallium became beneficial when the application was reduced to 0.1 p. p. m., and silver at this concentration gave a growth equal to that of the check; whereas cobalt, even at 0.1 p. p. m., appeared to be slightly detrimental to timothy.

It was further observed that "the absence of algae on soil to which rarer elements had been added denoted an unhealthful condition, unfavorable to the development of timothy. Even though the timothy made a good growth at the outset, it invariably died when these sensitive indicators, green algae, were not visible on the surface of the soil. The use of algae as test material to obtain data on the response of plants to 35 rarer elements was studied. The three species of algae employed varied in their growth behavior, emphasizing the inherent differences in tolerance to toxicity or susceptibility to stimulation present even in closely related members of the plant kingdom.

"In general, barium, boron, manganese, strontium, and tungsten increased the growth of all three algae, even at high concentrations—20 to 400 p. p. m. Aluminum was stimulating to *Crucigina* and to the species designated as No. 4, yttrium improved the growth of *Crucigina* and *Chlorella*, and bismuth, bromine, lithium, and zinc benefited No. 4 in the higher concentrations. For all three types of algae a low concentration of some elements, as iodine, mercury, and thallium, in the nutrient medium was necessary before growth became equal to or greater than that of the check. Cerium and silver were found to be toxic to *Crucigina* and *Chlorella*, uranium was deleterious to *Crucigina* and No. 4, bromine, cadmium, and selenium were injurious to *Crucigina*, arsenic and titanium were injurious to *Chlorella*, and cobalt, lead, nickel, tin, thorium, vanadium, and yttrium were detrimental to No. 4, until very low concentrations, 0.02 to 0.002 p. p. m., were attained. In every case but one, the addition of a rarer element at some concentration within the range of 0.002 to 400 p. p m. stimulated the growth of algae."

A simple but effective method of obtaining a quantitative measure of the growth of algae consisted in extracting the chlorophyll by hot ethyl alcohol and comparing the color obtained with that of a standard solution of potassium chromate.

Measurements of the oxidation-reduction potential of soil and nutrient solutions used disclosed no relation between the toxic or stimulative properties of any element and effect on the oxidation-reduction potential of the growth medium.

[**Soil and fertilizer studies by the Kentucky Station**] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 20, 21–24, 58*).—Correlations are reported between the yield and the proportions of soluble nitrogen and phosphate phosphorus in the lower conducting tissues in tomato plants to determine whether such tests can be used to indicate soil deficiencies. Studies are also noted of nitrogen fixation from bare lysimeters and others planted to wheat; the availability of various phosphates on soil of different types, limed and unlimed; the residual effect of superphosphate and rock phosphate; rate of liming and fineness of limestone; the use of manure; and fertilizer and liming tests in the sandstone area.

AGRICULTURAL BOTANY

A textbook of general botany, R. M. HOLMAN and W. W. ROBBINS (*New York: John Wiley & Sons; London: Chapman & Hall, 1934, 3. ed., pp. XV+626, pl. 1, figs. 463*).—The third edition of this college textbook (E. S. R., 61, p. 512), designed for a year's course, has been revised to reflect recent additions to botanical knowledge and to improve its usefulness by the inclusion of many new illustrations and certain additional material. The book, with its emphasis on the anatomy and physiology of higher plants, is well adapted for agricultural students.

A proposed classification of the chemical elements with respect to their functions in plant nutrition, R. W. THATCHER (*Science, 79 (1934), No. 2056,*

pp. 463–466).—The suggestion here presented from the Massachusetts State College had the objects (1) of systematizing and perhaps simplifying the teaching of mineral nutrition of plants and (2) of establishing a systematic basis for studies of the specific functions of the chemical elements in plant nutrition, with special reference to those of the rarer elements discussed in a previous paper.[2]

The "essential" and "nonessential" elements were grouped according to their known properties and functions in the metabolic processes of the higher green plants and with respect to their positions in the periodic table as follows: Groups (1) H and O, energy exchange elements; (2) C, N, S, and P, energy storers; (3) Na, K, Ca, and Mg, translocation regulators; (4) Mn, Fe (Co and Ni), Cu, and Zn oxidation-reduction regulators; (5) B, Al, Si, As, and Se, ampholytes; (6) Cl and F (Br and I), anion formers with fixed valence; (7) Co and Ni, cation formers with varying valence; and (8) Ge, Ba, and other rare elements, ampholytes. The functions of groups (5)–(8) are unknown, but the groups were set up on the basis of similar chemical properties as guides to future studies.—(*Courtesy Biol. Abs.*)

The cryoscopic method for the determination of "bound water", R. A. and W. A. Gortner (*Jour. Gen. Physiol., 17 (1934), No. 3, pp. 327–339, figs. 4; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 66*).—The criticisms by A. Grollman of the cryoscopic method for the determination of bound water as proposed by Newton and Gortner (E. S. R., 51, p. 26) are considered, and it is pointed out that even admitting the correctness of his contentions does not negative the conclusion that bound-water values as determined by the cryoscopic method parallel in a remarkable manner the physiological responses of plants to environmental conditions. A new method of calculating the true freezing point of a solution is proposed. Gum acacia in aqueous sucrose solutions showed positive amounts of bound water to the extent of from 0.5 to 0.7 g of bound water per gram of gum. Gum acacia in aqueous solutions of KCl and KBr showed slightly negative amounts of bound water, indicating a preferential adsorption of the solute rather than the solvent.

Some methodical errors which may arise in the determination of bound water, H. B. Bull (*Jour. Gen. Physiol., 17 (1933), No. 1, pp. 83–86; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 62*).—The "bound water" hypothesis is shown to have an adequate theoretical basis. It was found that a relatively slight adsorption of the solute along with water molecules (bound water) will explain the failure of certain technics to demonstrate the existence of bound water in biochemical systems.

A photoelectric device for the rapid measurement of leaf area, R. B. Withrow (*Jour. Agr. Res. [U. S.], 50 (1935), No. 7, pp. 637–643, figs. 3*).—In this contribution from the Indiana Experiment Station an apparatus is described which eliminates the use of lens systems by placing the leaves on a ground-glass diffusing screen and irradiating the diaphragm upon which the screen is set with a highly diffused, uniformly distributed source of radiation originating from a battery of tungsten lamps. One or more photoelectric cells receiving the light transmitted through the diaphragm show the decrease in total light intensity due to obstruction by the leaves. Light transmission through leaves, edge effect, and calibration of the instrument are discussed.

Influence of deuterium oxide on the rate of photosynthesis, J. Curry and S. F. Trelease (*Science, 82 (1935), No. 2114, p. 18*).—Experiments are reported as showing that, when measured directly, the rate of photosynthesis

[2] Science, 76 (1932), no. 1970, pp. 281–285.

with 99.9 percent D_2O is about 0.41 of that with ordinary water. The difference in rates cannot as yet be explained in terms of the mechanism of the reaction,* but the use of D_2O provides a new experimental approach to the problem of establishing a satisfactory theory for the mechanism of photosynthesis.

Researches on the cuticle.—IV, Cuticular relief and the epidermal differentiation of the floral organs [trans. title], P. MARTENS (*Cellule, 43 (1934), pp. 287–320, pls. 2, figs. 36*).—This study, in continuation of one published in 1934 on the structure, origin, and role of the cuticular relief of petals of *Tradescantia*, was carried out on the floral epidermis of six species of plants (*Epilobium spicatum*, *Lythrum salicaria*, *Viola tricolor*, *Pelargonium zonale*, *T. virginica*, and *Centaurea cyanus*), each belonging to a different family and chosen to represent distinct types of epidermal structure.

Observation of the progressive differentiation of the epidermal relief in each of these six species showed that the same general interpretation applies essentially to all, viz, that the production and orientation of the cuticular relief are two entirely distinct and normally succeeding phenomena. The first is due to a temporarily "excessive" production of cuticular substance translated into an increase of surface, and with the resulting undulations occurring in all directions. The subsequent orientation of these cuticular folds is caused by the stretching in a definite direction undergone by the epidermal cell in its differentiation and variable with the particular character of the cell.

The paper also includes various histologic and histogenetic data concerning the stages of epidermal differentiation, the appearance of the cuticular relief in section, the intercellular spaces of the floral epidermis, and related phenomena. The superficial and vertical appearances of the different types of relief studied are illustrated and discussed in detail.

Changes in hydrogen-ion concentration of culture solutions containing nitrate and ammonium nitrogen, S. F. and H. M. TRELEASE (*Amer. Jour. Bot., 22 (1935), No. 5, pp. 520–542, figs. 6*).—In this study, wheat plants were grown in culture solutions with initial adjustment to pH 4.3, 5.1, and 6.0 by means of suitable proportions of H_3PO_4, KH_2PO_4, and K_2HPO_4. A wide range of NO_3 : NH_4 ionic ratios was obtained by varying the proportions of KNO_3 and $(NH_4)_2SO_4$, KNO_3 and NH_4NO_3, and $Ca(NO_3)_2$ and NH_4NO_3. The total nitrogen concentration was the same for all solutions, which were renewed every 8 days. Records of the H-ion concentrations of the solutions were made over a culture period of 102 days.

With low NO_3 : NH_4 ratios the pH values of the solutions decreased rapidly under the influence of the plants, in extreme cases approaching pH 3.0. With high ratios, the reverse was true, tending to reach a limiting value of pH 6.5.

However, with a suitable NO_3 : NH_4 ratio, a physiologically balanced solution was obtained in which the H-ion concentration tended to remain approximately constant during the 8-day period between solution renewals. By balancing the partial concentration of NO_3 (absorption of which removes H ions from the solution) against that of NH_4 (absorption of which removes OH ions), the various conditions tending to decrease the acidity could be exactly opposed by conditions tending to increase it. This method proved far more effective than that of attempting to stabilize the solution by greatly increasing the phosphate buffer content. To maintain a higher pH value, it was necessary to use a higher ratio of NO_3 to NH_4.

With age, the plants gradually changed in their ability to alter the reaction of the solution. For the most accurate control of the pH values throughout the life cycle, it would, therefore, be necessary to use progressively lower NO_3 : NH_4 ratios. Nevertheless, an approximately constant pH value was maintained throughout the culture period by using a suitably selected intermediate

$NO_3:NH_4$ ratio. Thus, a very satisfactory stabilization of the pH values was obtained when $NO_3:NH_4$ ionic ratios of 50:50, 80:20 or 90:10, and 95:5 were used for maintaining pH 4.3, 5.1, and 6.0, respectively. The average changes in reaction after 8 days in contact with the roots were pH 0.28, 0.21, and 0.08, respectively. Excellent growth was secured with a culture solution having a stable pH value of 5.1.

The results of these studies emphasize the advantages and provide an effective and practical means of employing physiologically balanced solutions which, under the influence of absorption and excretion of substances by the plant, tend to maintain a constant H-ion concentration. Obviously, however, the method in its present form cannot be used for comparing the effects of NO_3 with those of NH_4 on the rate or type of plant development.

Microincineration studies.—I, Localization of inorganic elements in plant cell walls, F. M. UBER and T. H. GOODSPEED (*Natl. Acad. Sci. Proc.*, *21* (*1935*), *No. 7, pp. 428–433, figs. 11*).—The method of microincineration described involves (1) the preparation of thin sections of fresh material mounted on slides without the addition or extraction of mineral elements, (2) heat treatment to consume the organic components while preserving the nonvolatile minerals in situ, and (3) critical examination of the residual ash. The sections are held in place on the slides by deashed gelatin smears hardened by formaldehyde vapor. A specially designed electric oven for the microincineration is described in which a temperature of 600° C. can be obtained.

Using transverse sections of the xylem of *Trochodendron aralioides* and *Betula papyrifera* and of the redwood of *Taxodium*, cut fresh at 5μ thickness and preserved in 95 percent alcohol, the author, working at the University of California, demonstrated the applicability of the technic to anatomical, histogenetic, and chemical problems in plants.

Effect of boron on the growth of certain green plants, A. RODRIGUEZ GÉIGEL (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *19* (*1935*), *No. 1, pp. 5–28, figs. 5*).—Employing the usual water-culture methods on *Spirodela polyrhiza*, boron proved toxic at concentrations above 1 p. p. m. and above 5 p. p. m. caused death. Chlorosis occurred in all cultures but was slightly more pronounced in the boron-treated plants than in the controls. The addition of inorganic iron was without effect on either group, but potassium tartrate at 20 p. p. m. induced marked chlorophyll development in both.

Employing pure culture methods, boron at certain concentrations apparently induced increased growth, but at 5 p. p. m. toxicity was noted. However, no chlorosis developed in these tests.

In similar pure-culture tests, even with high boron content, *Chlorella* likewise failed to develop chlorosis, though at some concentrations growth was reduced. It proved extremely resistant to boron. No decrease of available iron was noted in culture solutions containing boron, and, though a precipitate gradually formed, no boron was found therein. The addition of potassium tartrate or of sodium citrate, which increase both iron availability and growth, failed to reduce the toxicity of boron. The presence of boron likewise failed to reduce the toxicity of iron. The controls without boron were improved by the addition of tartrate or citrate, but the boron cultures showed in general the usual increase or decrease of growth noted in the cultures without tartrate or citrate.

The results with dextrose or with sucrose apparently indicated that plants with high sugar content are more tolerant to boron than those with low sugar content.

Indole-3-n-propionic acid as a growth hormone and the quantitative measurement of plant response, A. E. HITCHCOCK (*Contrib. Boyce Thompson*

Inst., 7 *(1935), No. 1, pp. 87–95, fig. 1*).—Indole-3-*n*-propionic acid (β-indolylpropionic acid) induced the same bending, swelling, proliferation, and rooting responses in certain plants as a synthetic preparation of heteroauxine (β-indolylacetic acid). Three methods are described for determining the relative effectiveness of different growth-promoting substances in causing the cell elongation resulting in the epinasty of leaves, viz, (1) rubbing a lanolin preparation of the substance on the surface of petioles or stems by a glass rod; (2) introduction of an aqueous preparation by small glass tubes inserted into the petiole tissue; and (3) placing the basal ends of tomato cuttings in an aqueous preparation. By these procedures the application of the preparations required only a few seconds and the time for the initial response from 2 to 16 hr. The bending responses occurred both in light and in darkness in a greenhouse with temperatures of from 21° to 26° C.

Quantitative measurements of the epinastic responses of tomato and tobacco leaves showed significant differences in the degree of bending and the rate of recovery at concentrations of growth-promoting substance differing by one-fifth. *The approximate minimum active lanolin preparation in causing epi*nasty of tomato leaves was 0.08 mg of either growth substance per gram of lanolin.

Distinct differences in the localization of the responses were observed according to the concentration of the chemical, the method of application, and the plant species used. Lanolin preparations induced the most localized responses. The most localized rooting response occurred with buckwheat, tobacco, and African-marigold. Cut tomato stems in aqueous preparations showed a relatively rapid upward movement of the substance, which acted directly or indirectly in producing the response. Here the upward movement was much faster than in the marigold.

By the use of one or more of these methods it is believed that considerable information may be obtained as to the direction, rate of movement, and the channels through which growth-promoting substances travel. Furthermore, the fact that one homologue of heteroauxine proved active in causing certain formative responses indicates the possibility that other indole derivatives and perhaps other unrelated chemicals might induce one or more of these same responses.

The growth hormone and the dwarf type of growth in corn, J. Van Overbeek (*Natl. Acad. Sci. Proc.*, *21 (1935), No. 5, pp. 292–299, figs. 3*).—In this preliminary report of studies of the dwarf type of growth in nana corn, it is shown that more growth substance (auxin) is destroyed than in normal corn, thus causing the inhibition of growth in the dwarf. This higher destruction of auxin in turn may be due to changes in the oxidation-reduction properties of the nana corn.

Radioactivity and plant growth [trans. title], F. A. van Baren (*Landbouwk. Tijdschr.* [*Amsterdam*], *47 (1935), No. 575, pp. 426–433*).—This is a review of the effects of radioactivity on the functions and growth of plants, including a literature list of 25 titles.

Effects of certain environmental factors on germination of Florida cigar-wrapper tobacco seeds, R. R. Kincaid (*Florida Sta. Bul. 277 (1935), pp. 47, figs. 2*).—The studies here reported were intended to serve as a basis for further work on the physiology and pathology of cigar-wrapper tobacco varieties grown mainly in Gadsden County, Fla., and concern the relations and interrelations of temperature, pH, and light to seed germination. The following are the more important conclusions drawn:

The cardinal points for germination are about 10°, 24°, and 34° C. At certain daily alternations of temperature it is a little more rapid than at the optimum.

The apparent isoelectric point of the seeds is about pH 6.8.

Light was required for the germination of all 19 samples tested. Exposure of imbibed seeds to direct sunlight for 0.01 sec. induces an increase. The amount of light must be successively increased by approximately constant multiples to cause equal increases in the percentage of germination. Sensitiveness to comparatively weak light attains a maximum after about 4 days of soaking at from 19° to 23° and decreases with further soaking until an equilibrium is reached after about 10 days. Air-dry seeds are insensitive to light. The effect of light on imbibed seeds is not reversed by subsequent drying. Light is still required for germination of seeds soaked and dried in darkness. Considerable germination is induced by exposing imbibed seeds to a total radiation of about 10^{-6} gram-calorie per square centimeter, of which about 10^{-8} gram-calorie is in the visible region from 497 mμ to about 700 mμ. The visible radiation per seed is of the order of 10^{-11} gram-calorie, and the number of quanta is about 10^{8}. Green light of a wave length to which the eyes are most and the seeds least sensitive induces considerable germination. A 15-min. exposure of imbibed seeds to moonlight induces a high percentage of germination.

Seeds germinating poorly or not at all in darkness at constant temperature germinate well in darkness at alternating daily temperatures between 23° and 5°. Seeds made insensitive to light by soaking in darkness and drying in light germinate much better at 35.5° in light than in darkness. Between 0° and about 40° the effect of light on imbibed seeds is independent of the temperature of the seeds while exposed. A short treatment at 0° in darkness does not induce germination in darkness but apparently exerts a favorable effect on seeds exposed to light. Similar treatment at 40° not only induces considerable germination in darkness but also exerts a favorable effect on seeds exposed to light. At a 5-mm depth in the soil, seeds germinate much better at alternating than at constant temperatures.

A general discussion of the relation of light to germination is included.

The effect of the alkyl halides on the respiration of potato tubers, L. P. Miller (*Contrib. Boyce Thompson Inst., 6 (1934), No. 3, pp. 279–296*).—Potato tubers were exposed in closed containers to the vapor from various alkyl halides for 24 hr., and the CO_2 given off during the 24-hr. treatment period and for 24 hr. thereafter was determined. The differences in the effects of some isomeric and otherwise closely related compounds were evident, not so much with regard to the amount of increase in the CO_2 output but rather with respect to the concentration necessary to bring about this increase.

Increases of several hundred percent in the CO_2 output were obtained with 0.05 cc per liter of ethyl, *n*-propyl, *n*-butyl, *n*-amyl, and isoamyl bromides. Secondary propyl and butyl bromides, when applied in the same concentration, produced increases only about one-fifth of those resulting from the isomeric normal compounds. The effect of isobutyl bromide was considerably greater than that of the secondary but less than that of the normal. Tertiary butyl bromide brought about an increase intermediate between that of the secondary and iso compounds. The increases in CO_2 output resulting from treatments with the secondary compounds were greater when higher concentrations were used. The normal chlorides and iodides (propyl compounds) were also more active than the corresponding secondary compounds. The bromides were much more effective than the chlorides, and the iodides somewhat more active than the bromides.

The relative efficacy of the alkyl halides is thus related to their reactivity in certain chemical reactions. The effect of a particular chemical treatment on the respiratory activity is not correlated with its effect on dormancy.—(*Courtesy Biol. Abs.*)

Further experiments on the effect of halogenated aliphatic compounds on the respiration of potato tubers, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 7 (*1935*), *No. 1*, *pp. 1–17*).—In continuation of studies on the effects of the alkyl halides noted above, the present paper reports the results of experiments on a number of additional compounds, with emphasis on those closely related to ethylene chlorohydrin.

Experiments with about 50 halogenated derivatives of the aliphatic hydrocarbons showed that all of those which are sufficiently volatile are powerful stimulants of the respiratory activity of potato tubers exposed to their vapor in a closed container for 24 hr. Their effects are similar in that they all produce a very prompt rise in the respiratory activity soon after the beginning of the 24-hr. treatment period, which reaches a maximum only some time after cessation of treatment. Treatments producing any effects at all always result in increases in CO_2 output. Decreases were not observed, even with many times the minimum lethal concentrations.

However, differences in the action of these compounds were evident, both as to the concentrations necessary to cause large increases and as to the range of concentrations from the smallest amount causing an increase to the highest concentration tolerated without injury. Thus, with similar low concentrations, the alkyl bromides are much more effective than the chlorides and the iodides somewhat more so than the bromides, and the normal halides are more active than their corresponding secondary compounds. Ethylene bromide is more active than ethylene chlorobromide, and the latter is more so than ethylene chloride. The ethylidene compounds are less active than the ethylene compounds. Ethylene chlorohydrin and bromohydrin are less active than the corresponding dichloride and dibromide, but are less toxic. The effective ranges of concentrations for ethylene bromohydrin and chlorohydrin extend from 0.016 to 4 and from 0.031 to 8 millimols per liter, respectively, and for ethylene bromide and chloride from 0.0045 to 0.030 and from 0.063 to 4 millimols, respectively. Of the compounds in the homologous series, methylene, ethylene, propylene, and butylene bromide, the ethylene is the most effective. Propylene bromide is less active than the isomeric trimethylene bromide, and α-butylene bromide is more active than the β compound and the latter than isobutylene bromide. Ethylene bromide and chloride are more effective than dibromoethylene and dichloroethylene.

A comparison of the relative effectiveness of these compounds with their chemical reactivity indicates that their effects on respiration are closely identified with their chemical properties. Treatments which increase respiration also cause increase in the pH values of the expressed juices of the tubers.

Nitrogenous metabolism in Irish potatoes during storage, N. W. STUART and C. O. APPLEMAN (*Maryland Sta. Bul. 372* (*1935*), *pp. 191–214*).—Nitrogen distribution in Irish Cobbler and McCormick potatoes stored at 2°–3° C. remained remarkably stable up to 5 mo. A very slight protein synthesis had occurred in the McCormick variety toward the end of this low-temperature storage period.

Whole-tuber analyses failed to disclose changes in nitrogen distribution during the rest period. With the advance of senescence and sprouting of the tubers at room temperature or at a constant temperature of 22°, a very slight hydrolysis of the protein reserves occurred.

A difference of 4.5 percent in the moisture content of the tubers due to different humidity conditions of storage had no effect on the nitrogen metabolism.

Potato sprouts were higher in total and residual nitrogen and much lower in basic nitrogen than the tubers from which they grew. The total nitrogen in a late crop of Irish Cobblers was much higher than in an early crop, but the proportion of protein to nonprotein nitrogen was nearly the same in both. Variable conditions of culture seem to induce chiefly quantitative rather than qualitative differences in nitrogen distribution in the tubers.

Considerable variation was found in the amounts of the nitrogen fractions in different parts of the tuber, the nonprotein nitrogen being much higher in the medulla than in the cortex. The importance of this condition in relation to the cutting of tubers for seed is discussed.

A study of the nitrogen metabolism associated with the reversion of parenchymatous cells to embryonic cells of the new cork cambium which gives rise to wound periderm showed that the protein and basic nitrogen increase at the expense of the amino nitrogen. The amide fraction remains constant, and the amino acids rather than the amides are concerned in this regeneration of proteins.

The most important general deduction from the study concerns the very slight shifting in the relative proportions of the nitrogen fractions of tubers under any conditions during their natural storage life.

Thiourea prevents browning of plant tissues and juices, F. E. Denny (*Contrib. Boyce Thompson Inst., 7 (1935), No. 1, pp. 55–61, fig. 1*).—Soaking slices of apple tissue for 1 min., or even dipping them, in a 0.1 percent solution of thiourea prevented browning of the cut surfaces on subsequent air-drying. Favorable results also were obtained with pear, banana, and eggplant, but with potato only a retardation of browning resulted. The addition of thiourea to give a concentration of 0.01 percent to freshly expressed apple juice prevented darkening. If the juice had already darkened by contact with air, this amount induced decolorization to a colorless condition if added soon after expressing and to a much lighter brown if oxidation in the air had proceeded for as much as 4 hr. The addition of 1 cc of freshly expressed pineapple juice to 4 cc of browned apple juice caused only a temporary decolorization.

Evidence was obtained that in the darkening of apple juice by oxidation in the air two reactions occur simultaneously. One is rapid and reversible, forming a dark brown oxidation product which can be reduced to relatively colorless compounds by the addition of thiourea or of pineapple juice. The other reaction is slow and nonreversible, forming a light brown oxidation product, the oxidation of which is inhibited by thiourea but not by pineapple juice, and the reduction of which cannot be effected by the addition of either.

Pantothenic acid and the nodule bacteria-legume symbiosis, C. H. McBurney, W. B. Bollen, and R. J. Williams (*Natl. Acad. Sci. Proc., 21 (1935), No. 6, pp. 301–304*).—Using alfalfa (*Medicago sativa*) and its root-nodule organism (*Rhizobium meliloti*), in studies conducted at the Oregon State College, it was demonstrated that one of the significant chemical substances elaborated by the bacteria and passed on to the host plant is pantothenic acid, and that even minute amounts of this substance exert striking stimulatory effects on the early, and often critical, stages of growth and on the carbohydrate anabolism of alfalfa, but that it does not, alone, enable the host plant to fix atmospheric nitrogen.

The cross-inoculation of bacterial-plant group of Cicer, M. S. Raju (*Science, 81 (1935), No. 2113, p. 639*).—The results of investigations conducted at the University of Wisconsin, based on studies of cross-inoculations with pure

cultures of all the known bacterial-plant groups, showed that the root-nodule bacteria of *C. arietinum* are specific for that host and may be considered a separate group.

The life history and cultural characteristics of Typhula gyrans (Batsch) Fries, J. A. Macdonald (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 590–613, pls. 2, figs. 34*).—This investigation of the life history of *T. gyrans* was undertaken primarily to determine its degree of pathogenicity, but infection experiments yielded negative results and it appears probable that the fungus is only a saprophyte in Great Britain.

Resting sclerotia for the study were obtained on dead swede petioles. The mycelium is pure white under cool, moist conditions, but under adverse conditions a brown resistant type is produced. The sporophore arises usually from a sclerotium as a simple club, or it is slightly branched. It is divided into a stalk and a fertile head, the outside of which is completely covered by a layer of four-spored (averaging 5.6μ by 4.4μ) basidia. In culture the sporophore may arise from the mycelium, while the division into stalk and head and the restriction of the hymenium to the head may break down. Branching is often profuse. Structures intermediate between sporophore and sclerotium were found. These latter are similar in fundamental construction. Clamp connections are present on normal hyphae and absent from monospore mycelia. The fungus is heterothallic. The union of two unlike monospore mycelia is necessary to complete the life cycle.—(*Courtesy Biol. Abs.*)

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, April 1 to June 30, 1933 (*U. S. Dept. Agr., Inventory 115 (1935), pp. 51*).—This number (E. S. R., 72, p. 598) lists 1,029 lots of plant material introduced for testing in various parts of the United States, with descriptive notes in some cases.

GENETICS

Cytogenetics of tetraploid maize, L. F. Randolph (*Jour. Agr. Res.* [*U. S.*], *50 (1935), No. 7, pp. 591–605, figs. 10*).—Tetraploid strains of corn induced at Cornell University in cooperation with the U. S. Department of Agriculture by heat treatments (E. S. R., 69, p. 40) resembled the related diploid strains in height and growth habit, but had broader and thicker leaves, sturdier stalks, and larger spikelets, ears, and grain. Increase in nuclear and cell size with no apparent decrease in chromosome size accompanied chromosome doubling, and as a result the pollen and stomata as well as the various organs of the 4*n* plants were larger than those of the 2*n* sister plants. A high degree of incompatibility was exhibited by the tetraploid strains in crosses with the diploid strains. Fertility as measured by the proportion of viable to nonviable seeds was less than 0.5 percent when the diploid was the seed parent, and ranged from 3 to 5 percent in the reciprocal cross. This marked incompatibility seemed due to quantitative rather than qualitative chromosomal differences, since it occurred in crosses between induced 4*n* stocks and 2*n* parental stocks having the same kinds of genes. Pollen of tetraploid plants usually cannot compete successfully with that of 2*n* plants, either on its own silks or on silks of 2*n* plants, as indicated by results of open and controlled pollinations in isolated mixed plantings of 2*n* and 4*n* stocks. The progeny of the 4*n* and 2*n* intercrosses with a single exception were triploid hybrids. The tetraploid corn breeds true for tetraploidy and can be maintained under natural field conditions together with ordinary diploid corn without appreciable hybridization.

The chromosomes of the tetraploid formed quadrivalents and bivalents at reduction, with usually 7 to 9 quadrivalents and 3 to 1 bivalents, and tri-

valents and univalents were rarely seen. The irregularities in meiotic chromosome distribution noted appeared to account for the observed inconstancy of number in the microspores and in the progeny of the tetraploids. There was no definite positive correlation between the atypical chromosome numbers observed in 4n progenies, consisting of one or a few chromosomes more or less than the typical number 40, and deficient vigor or unusual growth habit.

Genetic experiments on hybrid vigor in maize, E. W. LINDSTROM (*Amer. Nat., 69 (1935), No. 723, pp. 311–322, figs. 2*).—In a biometric analysis of F_1 and F_2 generations from crosses of inbred lines of corn at the Iowa Experiment Station, dealing with ear weights (yield) and some of its components, as ear length, diameter, and number of kernel rows, the F_2 curves of individual ear weights were not markedly skewed but the constituent parts of ear weight exhibited great skewness. Both ear length and diameter showed negative skewness, indicative of dominance of large size, whereas number of row curves showed positive skewness. Balance between these positive and negative trends was reflected in the decreased skewness of the ear weights themselves. Multiple correlation studies afforded verification for these relationships. Absence of skewness in yield itself may be attributed to a balance of genes, some of which exhibit dominance for large size and some for small.

Ashby's simple hypothesis of heterosis (E. S. R., 68, p. 602) was subjected to a critical test in which the "capital" (greater embryo or plant size) of the young hybrid plants was greatly reduced by decapitation in the young seedling stages. Despite this handicap the hybrids greatly exceeded their untouched parental lines in dry weight of plant and ear, proving that these hybrids must possess a higher growth rate. Conclusions are that hybrid vigor in corn is governed by a number of "size" genes having a marked degree of dominance and producing a higher rate of growth in the hybrid than is found in the parental inbred stocks.

The comparative root development of selfed lines of corn and their F_1 and F_2 hybrids, T. A. KIESSELBACH and R. M. WEIHING (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 538–541, fig. 1*).—In Nebraska Experiment Station studies on 2 pairs of selfed lines and their F_1 and F_2 hybrids, the F_1's showed material increases over the inbred parents in size of aboveground parts, depth of penetration of roots, combined length of all main roots per plant, and diameter of main roots, while the F_2's were intermediate in these respects.

The location of a gene for disease resistance in maize, V. H. RHOADES (*Natl. Acad. Sci. Proc., 21 (1935), No. 5, pp. 243–246, fig. 1*).—In this investigation conducted at Cornell University, cytological studies of deficiencies induced by X-rays and genetical studies of trisomic ratios indicated that the factor for resistance to physiologic form 3 of *Puccinia sorghi* is located in the short arm of the tenth and shortest chromosome of the haploid corn complement.

Derivative types obtained by backcrossing Nicotiana rustica-paniculata to N. rustica, W. E. LAMMERTS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 68 (1935), No. 3–4, pp. 416–435, figs. 19*).—Continuous backcrossing of the *N. rustica* (24_{II})-*paniculata* (12_{II}) hybrid to *N. rustica pumila* resulted in a series of true breeding derivative types having the same chromosome number (24_{II}) but quite distinct from *N. rustica pumila* and behaving as Mendelian units when crossed with it. Seven proved to be simple dominants, 2 recessives, and 2 others evidently were more complex. Characters differentiating these types from *N. rustica pumila* were not present as visible character contrasts in the 2 parental species. Explanation of these several derivative types is offered. See also previous notes (E. S. R., 68, p. 749; 72, p. 461).

Inheritance studies in gingelly—Sesamum indicum, C. M. John (*Assoc. Econ. Biol., Coimbatore, Proc., 2 (1934), pp. 33–40, pl. 1*).—The inheritance of several characters is reported on, with information on flowering and the technic of selfing and crossing. Deep purple was dominant over the white purple wash on the outer surface of the corolla with a ratio of 3:1 in F_2. The purple-lined anthers were dominant over white anthers, the factor for purple on anthers being expressed only when that for purple on the corolla is present. Purple ring at the base of the style was dominant over white style, being attributed to a single independent factor. Solitary flower in the axil was dominant over multiple flowers in the axil with simple Mendelian segregation. The 4-locule capsule was dominant over 6- or 8-locule capsules and was caused by a single gene difference, also with 3:1 segregation in F_2.

Inheritance of annual habit and mode of pollination in an annual white sweetclover, A. E. Clarke (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 492–496*).—In crosses between an annual strain of white-flowered sweetclover and common biennial white sweetclover, studied at the University of California, annual habit was dominant over the biennial with a 3:1 ratio in F_2. Reciprocal crosses with Hubam sweetclover indicated that the 2 annual strains, although of different origin, possess the same dominant mutation for annual habit. A plant described was partially annual and partially biennial, due apparently to a dominant somatic mutation, the annual portion being heterozygous for time of flowering.

The relative length of pistil and stamens was found to be correlated with ease of self-pollination, which occurs readily when both are of the same length and seldom when the pistil is the longer. The type of flower in which the pistil is longer than the stamens was found to be inherited as a simple recessive.

Studies of the inheritance of and the relationships between kernel texture, grain yield, and tiller-survival in crosses between Reward and Milturum spring wheats, O. S. Aamodt, J. H. Torrie, and A. Wilson (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 456–466*).—From the behavior of F_2 populations and F_3 lines from Reward (hard red) × Milturum (soft red) spring wheats and parental rows studied at Edmonton and Fallis, Alberta, inheritance of kernel texture appeared explainable on the assumption of polymeric factors. Starchy texture was dominant to vitreous texture. Grain yield appeared to be complex in inheritance, a partial dominance of low-yielding factors being indicated. No genetic relationship was found between grain yield and kernel texture. Genetic differences were not obtained in tiller survival of Reward and Milturum grown at Fallis. Significant positive correlations were obtained between grain yield and tiller survival and between vitreous kernel texture and high tiller survival.

Inheritance of cold resistance in winter wheat, with preliminary studies on the technic of artificial freezing tests, W. W. Worzella (*Jour. Agr. Res. [U. S.], 50 (1935), No. 7, pp. 625–635, fig. 1*).—The technic of control hardiness tests was studied, and the inheritance of cold resistance in winter wheat varieties was investigated on greenhouse-grown seedlings during three winters at the Indiana Experiment Station. More than 85,000 wheat seedlings were frozen in the development of a suitable technic for measuring cold resistance.

Plants hardened for 15 hr. at 34° F. under artificial illumination showed wider differences in estimated survival between wheats representing nonhardy, midhardy, and hardy types than when hardened longer at the same or different temperatures. Seedlings up to 32 days old were much more susceptible to cold than older plants, but after that period no difference in cold susceptibility was apparent up to 46 days. Plants showed less injury in dry than in wet

soil. No significant differences were noted in the estimated survival between slow and rapid thawing of wheat plants.

In the inheritance studies more than 40,600 plants of Poole and Minhardi and their F_1, F_2, and F_3 progenies were subjected to artificial freezing. The estimated survival of Poole was 24.1 and 23.3 percent and of Minhardi 53 and 51.5 for 1932-33 and 1933-34, respectively, and the F_1 plants 36.5 percent. The F_2 plants ranged from 7.5 to 52.5 percent survival, averaging 34.6. Families less winter hardy than Poole were recombined, strongly suggesting transgressive segregation in the direction of nonwinter hardiness. Indications were that cold resistance is inherited similarly to other quantitative characters, although the number of genetic factors involved could not be determined.

Variation in chiasma frequencies in Secale, Vicia, and Tradescantia, K. SAX (*Cytologia, 6 (1935), No. 2-3, pp. 289-293, figs. 2*).—Chiasma frequencies obtained in *S. cereale* and *V. faba* grown in Japan exceeded those obtained at the Arnold Arboretum. Such differences might be attributed to environmental variations which may occur in nature, although inherent varietal differences doubtless exist within the species. Variations found in *Tradescantia* showed that both factors may be operative in the single species.

The genetics of garden plants, M. B. CRANE and W. J. C. LAWRENCE (*London: Macmillan & Co., 1934, pp. XVI+236, figs. 53*).—An introduction to the essential principles of genetics and cytology, supplemented by an account of recent results in relation to horticulture.

The cytology of triploid and tetraploid Lycopersicum esculentum, M. UPCOTT (*Jour. Genet., 31 (1935), No. 1, pp. 1-19, figs. 17*).—The multivalent configurations observed at the John Innes Horticultural Institution in triploid and tetraploid tomatoes were of the types expected to result from a random distribution of chiasmata. Although varying in frequency from cell to cell, the configurations were statistically constant at successive stages. Metaphase chiasma frequency was highest in the diploid and lowest in the triploid, and the curve of variance was higher in the polyploids than in the diploids. The formation of quadrivalents in the tetraploid is said to lead to numerical nondisjunction, and this to reduced fertility.

Hybridism in Musa.—I, Somatic cytology of certain Jamaican seedlings, L. N. H. LARTER (*Jour. Genet., 31 (1935), No. 2, pp. 297-315, figs. 20*).—Gros Michel × Robusta, both triploid parthenocarpic varieties, yielded 15 seedlings, 14 of which were tetraploid and 1 triploid. It is believed that the tetraploids originated from Gros Michel female gametes fertilized with haploid Robusta pollen. F_1 plants × Robusta yielded progeny with somatic chromosomes ranging in number from 32 to 44, including triploids, tetraploids, and aneuploids. F_1 plants × Gros Michel yielded triploids, tetraploids, pentaploids, heptaploids, and aneuploids, but no hexaploids. The only F_2 plant observed proved to be an aneuploid with 34 somatic chromosomes.

[Papers in animal genetics] (*Amer. Soc. Anim. Prod. Proc., 1934, pp. 201-232, figs. 3*).—The following papers were briefly presented before the genetics section of the American Society of Animal Production:

The Correlation of Progress in Genetic Research with the Prevailing Practices in Animal Breeding, by H. C. McPhee (pp. 201, 202), with a discussion by W. A. Craft (pp. 203, 204); Artificial Insemination in Light Horse Breeding, by W. S. Anderson (pp. 205-207); Some Relations of Glutathione with Growth and Hereditary Size, by P. W. Gregory and H. Goss (pp. 208-211); Inbreeding Swine for Eight Generations, by R. E. Hodgson and R. T. Clark (pp. 212-214); The Relationship of Degree of Inbreeding to Size of Litter in Poland China Pigs, by J. H. Bywaters, C. C. Culbertson, and W. E. Hammond (pp.

215–217); A Six Years' Study of Crossbreeding Swine, by L. M. Winters, P. S. Jordan, and O. M. Kiser (pp. 218–220); The Afterbirth as an Index to the Thrift of the Lamb, by F. F. McKenzie and R. Bogart (pp. 221–224); Results of Mating Rams to Angora Female Goats, by B. L. Warwick, R. O. Berry, and W. R. Horlacher (pp. 225–227); and The Occurrence of the Double-muscled Character in Purebred Beef Cattle, by A. D. Weber and H. L. Ibsen (pp. 228–232).

Progeny test and individual performance as indicators of an animal's breeding value, J. L. Lush (*Jour. Dairy Sci., 18 (1935), No. 1, pp. 1–19, figs. 3*).—A statistical study of the biometrical relationships between progeny tests and individual performance records as indicators of an animal's transmitting ability is reported, with special reference to the breeding ability of dams where the numbers of offspring are limited.

With the complications from environment, selection, and heredity in the use of such tests, the author points out that "the general conclusion to be drawn from all these considerations is that only under rare and unlikely combinations of conditions would a progeny test based on as few as four daughters average in an unselected population as accurate an indicator of a dam's breeding value as the dam's own performance. . . . The progeny test is needed most where one sex cannot express the trait."

Selection may be based on pedigree, performance, and progeny test. Early selection on the basis of pedigree has more nearly exhausted the chances of further gains by this method and affords more likelihood of progress by performance or by progeny tests.

The brown variation and growth of the house mouse, H. W. Feldman (*Amer. Nat., 69 (1935), No. 723, pp. 370–374*).—Data are presented on the body weights of heterozygous black (Bb) and homozygous brown (bb) mice at different ages from three different strains. These data indicate that brown mice grow more rapidly than black mice, a fact which was observed by Green (E. S. R., 67, p. 231) and attributed to linkage of the brown recessive gene and a factor or factors for large size.

An inherited eye defect in the guinea pig, W. V. Lambert and E. W. Shrigley (*Iowa Acad. Sci. Proc., 40 (1933), pp. 227–230*).—A defective eye condition, ranging from a microphthalmia, with sensitiveness to light, to a dulling or drying of the cornea, was found in studies at the Iowa Experiment Station to be inherited as an incompletely recessive factor. Matings of defectives produced 4 normals and 56 defectives.

The inheritance of yellow-pigmented heads in domestic fowl, A. Deakin and G. Robertson (*Amer. Nat., 69 (1935), No. 723, pp. 378–380*).—F_1 and backcross matings of Barred Plymouth Rock birds with yellow-pigmented heads indicated that the character behaved as a simple recessive to the normal. Symbols "G" for nonyellow, and "g" for the yellow-headed character, are suggested.

Correlation studies of egg production and possible genetic interpretation, C. W. Knox, M. A. Jull, and J. P. Quinn (*Jour. Agr. Res. [U. S.], 50 (1935), No. 7, pp. 573–589*).—Results are presented of a statistical study of the records of 903 Rhode Island Red and 884 Single Comb White Leghorn pullets, as made in 1928, 1929, and 1930 at the U. S. D. A. Animal Husbandry Experiment Farm, Beltsville, Md., based on simple, multiple, and partial correlations between the following characters: Date of hatch, date of first egg, sexual maturity (age at first egg), number of eggs first 50 days, number of eggs to March 1, length of winter pause, percentage of egg production to

March 1, and number of eggs laid in August and September and during the last 50 days of the year.

From the correlation coefficients it was concluded that the percentage of egg production to March 1 and the number of eggs laid during August and September should be included in statistical and genetic investigations of egg production. Four major traits were correlated with total egg production as follows: Sexual maturity −0.272 and −0.296 for White Leghorns and Rhode Island Reds, respectively; percentage of production to March 1 +0.626 and +0.622; number of eggs laid during August and September of the year following the date of hatch +0.692 and +0.652; and broodiness in Rhode Island Reds −0.342.

Date of hatch and date of first egg were found to have an insignificant effect upon egg production for these birds, which were hatched during the 7 or 8 weeks of the regular hatching period.

The most probable multiple correlation coefficients for fowls of the universe between total production and the three most important traits—sexual maturity, rate as measured by percentage of production to March 1, and persistence as measured by number of eggs laid during August and September—were 0.866 and 0.886 for White Leghorns and Rhode Island Reds, respectively.

No evidence of linkage was found in either breed between the best measure of rate of production, sexual maturity, and percentage of production to March 1.

Precocious development of sexual characters in the fowl by daily injections of hebin.—I, The male. II, The female, L. V. Domm and H. B. Van Dyke (*Soc. Expt. Biol. and Med. Proc., 30 (1932), No. 3, pp. 349–353*).—In these tests the administration of hebin, a purified gonad-stimulating hormone prepared from sheep pituitary glands, to young male and female chicks, confirmed the results previously reported on subcutaneous homeoplastic hypophyseal implants (E. S. R., 69, p. 197). Slight modifications were noted, probably due to differences in the amounts of hormone supplied by the grafts and by the injections.

Maternal behavior in male rats, M. McQueen-Williams (*Science, 82 (1935), No. 2116, pp. 67, 68*).—Maternal behavior in adult male rats, following chronic administration of bovine anterior pituitary implants or thyroidectomy, was noted in studies at the University of California. The evidences of maternal behavior were making nests for young rats and in general mothering them. The pituitary glands were also considerably enlarged as compared with those of normal males.

The effects of bilateral and unilateral castration on the epididymis, with special reference to the mitochondria-Golgi complex, L. M. Winters (*Jour. Morph., 55 (1933), No. 2, pp. 387–419, pls. 5; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 43*).—Comparative studies of the effects of bilateral and unilateral castration of 20 mature and 36 immature male rats at from 1 to 8 weeks of age showed that bilateral castration was followed by marked regression and almost complete cessation of the secretion of the epididymis, whereas unilateral castration produced no marked change. The change in the mitochondria-Golgi materials, which seemed to be secretory products, coincided with the secretory activity of the tubule cells of the epididymis.

Ovarian development in calves, L. E. Casida, A. B. Chapman, and I. W. Rupel (*Jour. Agr. Res. [U. S.], 50 (1935), No. 12, pp. 953–960, fig. 1*).—A study of the genitalia from 278 dairy heifer calves is reported from the Wisconsin Experiment Station. Ovarian and follicular development in relation to body weight and uterine size were compared, ranging from a few days of age to

approximately 14 weeks, as estimated from dressed weights. "Approximately *one-half of the calves (irrespective of weight) had blood follicles present in* their ovaries, suggesting continuous follicular degeneration during early post-natal life."

An unfertilized tubal ovum in the cow, E. I. EVANS and F. W. MILLER (*Anat. Rec., 62 (1935), No. 1, pp. 25–30, figs. 2*).—An unfertilized tubal ovum, found in the third of the fallopian tube nearest the uterus of a cow 24 hr. after mating, is described and compared with tubal ova of the cow previously noted by Hartman, Lewis, Miller, and Swett (E. S. R., 66, p. 324).

The cytology of the corpora lutea of the ewe, V. WARBRITTON (*Jour. Morph., 56 (1934), No. 1, pp. 181–202, figs. 10*).—A histological study is reported from the University of Missouri on the corpora lutea in the ovaries of ewes removed from 1 to 26 days after the beginning of estrum. The formation of the corpus luteum was studied.

Intrauterine growth of albino mice in normal and in delayed pregnancy, E. V. ENZMANN (*Anat. Rec., 62 (1935), No. 1, pp. 31–45, figs. 2*).—The normal intrauterine growth curve of mice showed relatively slight increases during the 7 days preceding implantation, with a rapid increase during the 13 days after the implantation.

The average weights of the embryos, timed from the presence of the vaginal plug, are presented, as well as the average weights of the adnexa (placenta, amnion, amniotic fluid, chorion, and yolk sac), egg chambers, and pregnant uteri.

An extended gestation period, caused by mating immediately after parturition, and suckling of the young delayed implantation, but did not change the rate of growth after implantation occurred.

Experimental ovulation and the resulting pseudopregnancy in anoestrous cats, M. A. FOSTER and F. L. HISAW (*Anat. Rec., 62 (1935), No. 1, pp. 75–93, pl. 1, figs. 3*).—Histological study was made at the University of Wisconsin of the genital tract of 120 normal female cats killed at different times during the year, including the anestrous period from September to January. The characteristics of the tissues at different stages of the cycle are described. Experimental ovulation was induced in nonestrous, pregnant, and immature cats by injections of a follicular-stimulating fraction of the anterior pituitary followed by intravenous injection of the follicular-stimulating hormone or luteinizing extract, alone or in combination.

Crystalline progestin and inhibition of uterine motility in vivo, W. M. ALLEN and S. R. M. REYNOLDS (*Science, 82 (1935), No. 2120, p. 155*).—No difference was found in the effect of the needle form and the prism form of progestin in suppressing uterine motility in experiments with castrated rabbits.

On the fecundity of partially ovariotomized fowls, F. B. HUTT and D. T. GRUSSENDORF (*Jour. Expt. Zool., 65 (1933), No. 2, pp. 199–214, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 55*).—In attempting to check the results of Steggerda (E. S. R., 60, p. 633), 109 Single Comb White Leghorn pullets were partially ovariectomized at 8 weeks of age by the removal of from one-fourth to one-half of the ovarian tissue. Seventy-five of these were continued in the laying house in comparison with an equal number of controls.

The results showed that the partial ovariectomy had no significant influence on body weight or on mean age at sexual maturity. The operation significantly lowered average production from August 26 through April 30.

Changes in the position of chick embryos after the eighteenth day of incubation, N. F. WATERS (*Science, 82 (1935), No. 2116, pp. 66, 67*).—Studies at the Iowa Experiment Station of the position of more than 1,000 live embryos

in eggs showed that changes in position normally take place within the egg after the eighteenth day of incubation. All embryos examined on the eighteenth day only were in the normal hatching position, whereas of the eggs examined on the nineteenth day of incubation only 7.8 percent were in the normal hatching position, and on the twentieth day 50.1 percent were in the normal hatching position. As a result, many embryos dying between the eighteenth and twentieth days of incubation would be considered to be in abnormal positions.

Pigmentation in black-haired rats, M. H. HAYDAK (*Science, 82 (1935), No. 2118, pp. 107, 108*).—The change in the color of black rats, on an all-milk diet, to gray, with a subsequent darkening in the color when such animals were again placed on normal diets, was noted at the Minnesota Experiment Station. The color of the teeth of rats placed on the milk diet also usually changed to complete white and darkened again when the normal diet was furnished.

Results with one rat on an iron-copper-milk diet suggested the relationship of iron and copper to the color of the teeth.

FIELD CROPS

[Field crops experiments in Kentucky] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 9, 10, 13–16, 24–28, 29, 35, 48, 49, 57, 58, 59, 60*).—Agronomic research (E. S. R., 72, p. 35) of the station and Western Kentucky Substation, reviewed briefly, included rotation and fertilizer tests, a topping and suckering experiment, and a study of nicotine content, all with tobacco; breeding work with corn and barley; variety tests with wheat, oats, barley, potatoes, lespedeza, and alfalfa; effects of legumes in the rotation on yields of corn and wheat; crop rotations; study of chemical composition of lespedeza hay; and pasture experiments. The occurrence of a new weed, *Galium pedemontanum*, in the Bluegrass region, is reported with a description and control measures.

Choosing legumes and perennial grasses, F. S. WILKINS and H. D. HUGHES (*Iowa Sta. Bul. 331 (1935), pp. 89–152, figs. 17*).—The legumes considered of greatest value for different uses or soil conditions in Iowa include alfalfa, medium red clover, mammoth red clover, alsike clover, white clover, biennial white and yellow sweetclovers, Hubam clover, Korean lespedeza, dalea, and soybeans (not discussed here). The grasses of greatest economic importance in Iowa, considering seed supply, usefulness, and soil adaptation, are Kentucky bluegrass, timothy, redtop, brome, reed canary, and orchard grass.

The information assembled, based on extensive station experiments and personal observations on Iowa farms during prolonged periods, deals with soil adaptations; choice of legumes and grasses for hay, various types of pasture, and green manure, and the relative merits of different plants and mixtures for these purposes; varieties and seed sources of important legumes and grasses; and practices in establishing stands, including seeding, nurse crops, and reseeding. An index is provided.

The relation between effective rainfall and total calcium and phosphorus in alfalfa and prairie hay, H. A. DANIEL and H. J. HARPER (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 644–652, figs. 3*).—Samples of little bluestem grass and of alfalfa, both grown in 1929–33 on fertilized and unfertilized soil, were analyzed at the Oklahoma Experiment Station for total calcium and phosphorus, and these elements were correlated with the effective seasonal rainfall. During periods of high rainfall the calcium content of the plants decreased and the phosphorus content rose, and the reverse occurred when effective rainfall was low.

Effect of fertilizers, soil type, and certain climatic factors on the yield and composition of oats and vetch, G. O. Baker and S. C. Vandecaveye (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 12*, *pp. 961–974*, *figs. 8*).—Oats and vetch were grown, 1931–32, at the Washington Experiment Station in semi-arid climate and in southwestern Washington in humid climate on Felida silt loam, Olympic loam, and Chehalis clay loam in 12-qt. pails in duplicate series treated with no fertilizer, N, NP, NPCa, NPKCa, and NCa.

The fertilizers, soil types, and climate all seemed to influence yield and chemical composition of the crops. In yield, oats and vetch responded differently to nitrogen and lime and similarly to phosphate and potassium. Nitrogen depressed the phosphorus and calcium content of both crops, while phosphate and lime increased the phosphorus and calcium contents above those of plants receiving nitrogen alone but not above unfertilized plants. The percentage of calcium and phosphorus in the crops was affected especially by soil type, while nitrogen and potassium contents were only slightly affected. As to climatic differences, excluding moisture, in general the higher yields were obtained at the station. The same crops grown on the same soil under the same cultural conditions averaged higher in phosphorus and lower in calcium when grown in southwestern Washington than at the station. Effects of liming on the calcium content of both crops were more pronounced at the station.

Relative promptness of nodule formation among vetches, vetchlings, winter peas, clovers, melilots, and medics, J. F. Duggar (*Jour. Amer. Soc. Agron.*, *27* (*1935*), *No. 7*, *pp. 542–545*).—In promptness of nodule formation at the Alabama Experiment Station, 1926–31, woollypod, Hungarian, hairy, Monantha, Oregon, and narrow-leaved vetches, and Austrian winter pea averaged 6.5 to 8.5 days from emergence to the stage of generalized nodulation; Tangier pea, purple vetch, and Pearl vetch 9.5 to 11 days; bittervetch and lentil 13 days; Scotch vetch 13.5 days; and sweet pea, horsebean, and grass pea 19.5 to 23.5 days. The interval between emergence and generalized nodulation was longer for clovers, melilots, and medics than for typical vetches, the dissimilarity being attributed partly to specific characteristics of the hosts and partly to difference in the kinds of bacteria in the soil.

The killing effect of heat and drought on buffalo grass and blue grama grass at Hays, Kansas, D. A. Savage and L. A. Jacobson (*Jour. Amer. Soc. Agron.*, *27* (*1935*), *No. 7*, *pp. 566–582*, *figs. 8*).—Following the record heat and drought of 1933–34, live and dead short grass (buffalo grass and bluestem grama) were charted in the fall of 1934 on typical short-grass pastures and lawns on the Fort Hays, Kans., Substation in cooperation with the U. S. Department of Agriculture.

The short grasses killed by the heat and drought of 1933–34 averaged 74.8 percent on closely grazed and severely tramped areas, 64.6 on moderately grazed areas, and 44.4 percent on unwatered lawns. Repeated applications of water to lawns in 1934 were decidedly beneficial in overcoming the effect of the 1933 drought and counteracting similar conditions in 1934, only 14.5 percent of the short grasses failing to survive on lightly watered lawns and only 5.1 percent on heavily watered lawns. The average basal cover of short grass on all plats before the drought, 99 percent, was reduced by the heat and drought to 25.2 on closely grazed areas, 35.4 on moderately grazed areas, and 54.9 percent on unwatered lawns. Light watering in 1934 resulted in an average basal cover of 86.0 percent and heavy watering, 96.9 percent.

Direct and positive correlations existed between closeness of clipping for 1 yr. and survival from drought and between closeness of clipping and recovery due to watering. Climatic conditions were directly responsible for the injury

on all areas, although close grazing and tramping contributed to the mortality of many plants. Soil-moisture samples indicated that more water than needed was not applied to any lawn plats.

The influence of soil reaction (pH) on the yield and feeding value of hay, A. W. Blair, A. L. Prince, and S. H. Winterberg (*New Jersey Stas. Bul. 586 (1935), pp. 8, fig. 1*).—When alfalfa and mixed hay were grown on strongly acid (pH 4.6 to 5) Sassafras loam and on soil kept at different pH levels (between 5 and 7) by application of varying amounts of magnesian and nonmagnesian limestone, the yields and nitrogen percentage in the hay usually were increased as the pH of the soil was increased. In some cases yields were 4 to 5 times as large and the percentage of nitrogen in the hay on the well-limed plats often was nearly double compared with that on strongly acid plats. In most cases the yields and nitrogen percentage in the hay were higher with magnesian limestone than with an equal amount of calcium limestone. In one experiment a 4-yr. average showed nearly 10 times as much crude protein value per acre in hay from well-limed as from strongly acid plats. Hay from the second and third cuttings had a higher nutritive value than that from the first cutting.

Permanent pastures in Maryland: A survey of vegetation, soil fertility, and management practices, F. V. Grau (*Maryland Sta. Bul. 373 (1935), pp. 215–259, fig. 1*).—Information on pasture management practices, pasture soils and their fertility, botanical composition of pasture, and on weedy plants and their control, obtained in a State-wide survey made in June, July, and August 1934, and covering 275 farms providing 657 soil samples, is summarized for each of the 7 regional divisions of Maryland. Suggestions for pasture management, fertilization and liming, cultural treatment, renovation of old pastures and establishment of new pastures, grazing, and seed mixtures, based on the survey results, are included.

The forage vegetation of permanent pastures in Maryland consists principally of Kentucky bluegrass and white clover with lesser amounts of crabgrass, orchard grass, timothy, redtop, Canada bluegrass, black medic or yellow trefoil, and several of minor importance. In the Allegany region the edible vegetation is largely bentgrass and poverty grass. Bermuda grass is important only in the southern portions of the Coastal Plain region. For the State as a whole, more than 1 acre in every 4 was entirely unproductive for grazing on account of weeds, although in the best pastures weeds constituted less than 10 percent of all the vegetation.

A very definite relation existed between the amounts of soluble aluminum present in the soils, the lime requirement, the presence of weeds, and the quality of the pasture turf. Likewise, the amounts of Kentucky bluegrass and white clover coincided with the relative levels of fertility, particularly as to calcium, magnesium, and phosphorus. Only very small amounts of nitrogen were found in pasture soils.

The highest fertility levels, as indicated by quick soil tests, occur in the limestone soils of the State, and the lowest levels in the Coastal Plain and the Allegany regions. The relative amounts of the different soil nutrient elements on the whole agreed rather well with the relative amounts of the various components of the existing vegetation. The greater amounts of the more desirable herbage on pastures receiving lime in addition to manure and fertilizer coincided with the higher level of soil fertility. The tests for soluble aluminum and for lime requirement yielded the best information concerning soil fertility and agreed with the quality of pasture turf produced. In general, both lime and phosphorus are needed for the improvement of permanent pastures in Mary-

land, while the need for potash is questioned except in the limestone soils and in the Coastal Plain soils where it is extremely low.

Top-dressing pasture lands with fertilizer, F. S. Prince, P. T. Blood, T. G. Phillips, and G. P. Percival (*New Hampshire Sta. Circ. 48 (1935), pp. 16*).—Fertilizer and liming experiments, similar to tests noted earlier (E. S. R., 64, p. 734), were supplemented by more elaborate tests, including comparisons of nitrogen carriers, on farm pasture land near Greenland and near Claremont on a terrace of the Connecticut River. The latter pasture gave greater increases for complete fertilizer compared with nitrogen alone than any other pasture studied, both grass and clover responding to minerals. Outside of the Connecticut Valley increases from minerals other than nitrogen upon grass have been slight. Over most of the State pasture response will depend on whether white clover is present or will grow with proper fertilization. White clover usually responded and about equally to phosphorus, potash, and lime, although exceptions were noted and in no case studied was lime the sole determining factor in its growth. If white clover cannot be induced to grow by complete fertilizers, straight nitrogen carriers are indicated for subsequent use on the pasture. From 2 to 11 times as much feed as the same money would buy commercially has been produced in these trials with fertilizers.

Suggestions for seeding permanent pastures, use of fertilizers, pasture management, and overcoming the pasture shortage usually prevailing in July and August, are included.

The trend of organic food reserves in alfalfa roots as affected by cutting practices, C. O. Grandfield (*Jour. Agr. Res. [U. S.], 50 (1935), No. 8, pp. 697-709, figs. 2*).—Research at the Kansas Experiment Station in cooperation with the U. S. Department of Agriculture, 1929–1932, considered the trend of nitrogen and carbohydrate root reserves in alfalfa as affected by cutting practices during the year, especially in late fall, and the effects of these reserves on plant survival. See also an earlier note (E. S. R., 71, p. 183).

When growth started in the spring, and after each cutting, total carbohydrates and nitrogen declined rapidly to a minimum, after which a rapid increase occurred. The minimum was reached about 20 days after cutting, and maximum accumulation apparently about in full bloom. Early and frequent cuttings, as in the bud stage, appeared to result in a lower carbohydrate and nitrogen content when winter came, and the converse held with infrequent cuttings. Clipping every 10 days after the last cutting greatly reduced the reserves and also the stand.

The amount of growth after the last regular cutting had a material bearing on organic reserves stored in the roots before winter. At least 8 to 10 in. of growth seemed necessary for maximum storage. Removal of aftermath when growth ceased in the fall resulted in a lower carbohydrate and nitrogen content than obtained by leaving aftermath on the plats, and this also resulted in a more vigorous growth and increased yield of the first cutting the next spring. The percentage of total carbohydrates in the alfalfa roots at similar growth stages decreased as the stand became older.

The residual effect of alfalfa cropping periods of various lengths upon the yield and protein content of succeeding wheat crops, W. H. Metzger (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 653-659, figs. 3*).—When foot-rot diseases, which seriously limited the value of yield determinations in certain years after the third wheat crop, in a study at the Kansas Experiment Station, were absent, alfalfa produced favorable effects on the yields of succeeding wheat crops. When the diseases prevailed, continuously cropped wheat plats produced the larger yields. Attempts were made to eliminate this factor in

evaluating the protein data. All periods of alfalfa cropping, ranging from 1 to 9 yr., produced increases in the protein content of wheat. Alfalfa cropping for as short as 2 yr. produced a favorable residual effect measurable by succeeding wheat crops over at least 8 yr., and the longer periods of alfalfa cropping resulted in greater residual effects. Indications were that residual effects may continue to be manifested longer in protein content than in yield.

The comparative root development of regional types of corn, R. M. WEIHING (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 526–537, figs. 4*).—Heritable characteristics of secondary root systems of corn varieties differing materially in above-ground size when grown under comparable conditions were studied at the Nebraska Experiment Station. The 8 varieties were grouped into small, medium, and large vegetative types whose respective mean values at maturity were for height 55, 87, and 92 in.; leaf area 658, 1,412, and 1,747 sq. in.; moisture-free fodder weight 248, 380, and 622 g; 88, 112, and 129 days from planting to ripening; and 8, 9, and 10 stalk nodes bearing functional main roots.

Size of the secondary root system tended to increase with that of above-ground parts. Based on the small type, the medium and large types had, respectively, 33 and 50 percent greater maximum spread; 9 and 10 percent deeper maximum penetration and 15 and 28 percent greater average depth of root penetration; 42 and 65 percent more functional main roots; 22 and 92 percent greater combined length of main roots per plant; 115 and 311 percent greater root weight; 86 and 268 percent greater root volume; and 10 and 29 percent larger diameter of main roots. The roots spreading less than 1.5 ft. from the stalk were about 3 times as numerous in all types as those spreading farther. These wide-spreading roots grew from the lowest 3, 4, and 5 nodes of the small, medium, and large varieties, respectively. The moisture-free weight of tops in the small, medium, and large varieties, respectively, was 6.42, 4.90, and 3.47 times as great as that of the roots.

Rapidity of root and top growth was about the same for all types until tasseling occurred in the small varieties. Thereafter, more vigorous growth caused the medium and large types to surpass in these respects. Similarly, as the medium type commenced tasseling, its vegetative development was exceeded by that of the large type.

The influence of low temperature on seedling development in two inbred lines of corn, O. F. SMITH (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 467–479, figs. 6*).—The comparative ability of seedlings of 2 inbred lines of corn to grow at low temperatures and maintain a well-balanced type of metabolism during early stages of seedling development was studied at the University of Wisconsin, using RYD_4 and GG_{ss} and subsequent progenies from crosses between them.

Seedlings of RYD_4 were normal green in color, whereas seedlings of GG_{ss} were typically virescent, almost devoid of chlorophyll, when both were grown in the greenhouse in winter at a temperature range of 16°–19° C., but both were green when grown at 24°. Indications were that this virescent character is probably inherited as a simple recessive to normal green. In the seedlings of GG_{ss} carotin was formed only when chlorophyll formation occurred, while xanthophyll was formed in the absence of chlorophyll pigments. Endosperm was utilized more rapidly in seedlings of GG_{ss} than in seedlings of RYD_4 when grown at 17° or 24°. While the amount of top growth produced was about the same when grown at 17° and 24°, more top growth was produced by RYD_4, however, when plants were grown to the third leaf stage at 24° and then shifted to 17° for 4 and 8 days.

At a soil temperature of 16°, seedlings of RYD$_4$ were highly resistant to *Gibberella* seedling blight, whereas those of GG$_{38}$ were very susceptible. The F_1 progenies showed about the same degree of resistance as the resistant parent. Seedlings of RYD$_4$×GG$_{38}$ were more resistant than F_1 progenies of the reciprocal cross.

The effect of injury in imitation of hail damage on the development of the corn plant, J. C. Eldredge (*Iowa Sta. Res. Bul. 185 (1935), pp. 61, figs. 21*).—In simulated hail injury studies with corn, 1928–32, total leaf removal (stripping) at weekly intervals from the 4-leaf to the first-tassel stages caused reduction in yield in almost direct proportion to the percentage of leaves unrolled when the plants were injured. Yield reduction ranged from 0 percent during early June to 100 about July 20 at the pretassel stage, decreasing gradually after the completion of fertilization and ending with a 5 percent reduction September 7 near maturity. Severe shredding at weekly intervals, removing about 50 percent of unrolled leaves, reduced yield 2 percent for the first 2 weeks in June. Yields then dropped gradually at each weekly period until the maximum (50 percent) reduction was reached at pretassel stage, and gradually rose to a 7 percent reduction on September 7. Removal of one-third and two-thirds of the leaves followed the same trends as shredding and stripping. Removal of one-half of each leaf at the pretassel, full-tassel, and milk stages reduced yields 27, 33, and 13 percent, respectively. Minor leaf injuries designed to upset elaboration and translocation of synthesized plant foods did not result in significant yield decreases.

The severe bruising of stalks and ears a week before tasseling reduced yield 20 percent, going to a 35 percent reduction at the full-tassel stage, and then yields gradually rose to a 6 percent reduction on September 7. Shredding in addition to bruising caused heavier reduction. Comparison for 1931 and 1932 showed that shredding reduced yields 64 percent and bruising 35 percent at the critical tasseling period, and a combination of the two reduced yields 13 percent more than shredding only. When six different strains of corn were severely shredded at two critical periods, significant differences in yield reduction among the strains were not apparent. Due to severe drought in 1930, moisture became the limiting factor, and leaf and stalk injuries resulted in smaller yield decreases than in normal seasons. In June reduction in leaf area reduced transpiration and resulted in somewhat larger yields from the injured than from check plats.

Leaf and stalk injury at all development stages resulted in slight reduction in kernel development as measured by test weight per bushel, except where a large proportion of the leaf area was removed either just before, during, or after the tasseling-silking period. Size of the ears was reduced by leaf removal earlier in the season, but weight per bushel was nearly normal. Bruising the ears resulted in 2 to 3 percent of damaged kernels, which would cause the corn to grade No. 2, but this was deemed unimportant under farm conditions. Some increases in percentage of smutted plants resulted from injury during the period of rapid development before tasseling, the number varying directly with the amount of smut occurring each year in uninjured corn. The type of injury was not related to smut infection except in 1929, when bruising the ears as silking began resulted in a decided increase in ear smut. No noticeable increase in other corn diseases resulted from any type of injury.

Effects of certain soil types, seasonal conditions, and fertilizer treatments on length and strength of cotton fiber, O. A. Pope (*Arkansas Sta. Bul. 319 (1935), pp. 98, figs. 5*).—A determination of certain measures of dispersion for a number of fiber and seed properties in cotton and an investigation

of the effect of soil types, seasonal conditions, and fertilizer treatments on these properties are reported. The studies included a uniformity test composed of 5 varieties replicated 10 times at each of 3 locations and a variety-location-season test consisting of 4 varieties at 4 locations in 3 yr. In the fertilizer test, which did not produce satisfactory results due to soil irregularity, 4-10-4 fertilizer was applied in increment steps of 200 lb. from 0 to 1,600 lb. per acre, including 2 locations in 2 yr. The 16 variables considered were weights of seed plus lint, of seed, and of lint, and percentage lint, all for gin data; mean length over ½ in., maximum length, modal length on a weight basis, primary mode on an estimated number basis, and secondary mode on a number basis, all concerned with length measures; percentage by weight ½ in. and less, and percentage weight in the modal group, which measure relative weight of fibers in different parts of the distribution; percentage number of fibers in the primary and in the secondary modal groups, and of fibers ½ in. and less, which measure relative number of fibers in various parts of the distribution; coefficient of variability; and tensile strength.

Analysis of variance for the uniformity tests gave F values showing infinite odds for a significant contribution of varieties in each variable. Highly significant to infinite F values were found for the contribution of locations in all variables except secondary mode. In all variables except weight of seed plus lint, weight of seed, and secondary mode, the interaction of variety × location attained significance, establishing a differential response of varieties to the environmental conditions represented by the different locations.

Comparison of relative contributions due to variety and location showed that, in general, the effect of variety greatly exceeds that of location, suggesting that these variables are controlled primarily by genetic factors, although the environment under which the fiber develops can modify significantly the inherent genetic capability. In weight of seed plus lint, weight of seed, and weight of lint, the relative contributions to total variance favored location compared with the other 13 variables in which the relative contribution of varieties was much greater. The contribution of block within location attained a significant contribution only in strength, indicating that strength is modified more than any other variable by small soil variations. A differential response of the several varieties to different environmental conditions was established.

The variety-location part of the variety-location-season study substantiated findings established in the uniformity tests. In the location-season part of the variety-location-season tests, weight of seed plus lint and weight of seed among gin data variables showed greatest similarity in response to different locations and seasons, being reasonably paralleled by weight of lint. The first 2 seemed closely associated with rank of precipitation, indicating that weight of seed depends largely on nutrition and water supply. Indications were that amount of lint per seed is relatively independent of rainfall, and that weight of seed is the main contributing factor in determining percentage lint.

The variables concerned with length showed, in general, a reasonably good agreement in rank of seasons and locations. Percentage of short fibers depends primarily on variety, being modified significantly by seasonal and soil differences. Weight of fiber in the modal group was, in certain cases, also modified significantly by environment. The variables concerned with the relative distribution of various lengths of fiber on a number basis agreed only partially in rank and significance, but supported the differential response of certain regions of the distribution to environment. The coefficient of variability verified the differential response of certain parts of the distribution to environmental conditions, suggesting that well-distributed rainfall during the growing

season contributes to uniformity in length of lint. Tensile strength attained a highly significant rank in locational and seasonal comparisons, indicating that relatively small environmental differences affect strength of fiber significantly.

Effect of fertilizers on the length of cotton fiber, E. B. REYNOLDS and R. H. STANSEL (*Jour. Amer. Soc. Agron., 27 (1935), No. 5, pp. 408–411*).—Since application of phosphoric acid to cotton at the Troup, Tex., Substation on Kirvin fine sandy loam, a soil that responds readily to phosphoric acid, apparently increased the length of fiber (E. S. R., 70, p. 767), a further fertilizer test was made in 1933 at the Angleton Substation on Lake Charles clay soil, which is low in phosphoric acid. While some significant differences in fiber length were obtained from the variously treated plats, they apparently were not caused by differences in the amounts of nitrogen, phosphoric acid, or potash, or by different rates of application.

Vitality and germination of crimson clover seed as affected by swelling and sprouting and subsequent drying, R. McKEE (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 642, 643*).—Swelling and subsequent drying for several days, if the radicle had not appeared, did not seem to affect the vitality of crimson clover seed, and when it was remoistened growth started quicker than in untreated seed. Seed that had a radicle showing when dried was seriously injured.

A new legume in Montana, J. R. GREEN and H. E. MORRIS (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 546–549, figs. 2*).—The wild pea (*Astragalus rubyi* n. sp.), found by the Montana Experiment Station in the Ruby Valley thriving in high-lime soil on moist bottom land containing more or less alkali, grows abundantly from the crown of a woody root, spreads over the ground for 2 or 3 ft. as a dense mat and soon crowds out other vegetation, forming relatively pure stands. Its slender stems may grow to 4 ft. in length and bear many leaves 3 to 5 in. long. It is a prolific producer of seed which are about the size of alfalfa seed. The roots are similar to those of alfalfa and bear many nodules. It resembles alfalfa in content of protein, nitrogen-free extract, crude fiber, ether extract, and ash, but it contains a considerably higher percentage of phosphorus than alfalfa growing in the same region.

Seed value of potatoes grown in different crop rotations with irrigation, H. O. WERNER (*Amer. Potato Jour., 12 (1935), No. 5, pp. 118–124*).—Average yields, 1930–32, suggested that superior yields were procured from Triumph seed potatoes grown at the Scottsbluff, Nebr., Substation in 4- and 6-yr. rotations and from manured rotations. However, seed from the continuous potato plat averaged more productive than those from 2- and 3-yr. rotations. The percentage of U. S. No. 1 grade potatoes was higher in the crop from long than from short rotations and from the irrigated stock than the dry-land stock. A tendency was noted toward a slightly higher nitrogen percentage in tubers from long rotations, including alfalfa, than in those from a 2-yr. rotation containing corn as the other crop. Tubers from these less productive short rotations had a higher percentage of acid hydrolyzable polysaccharides than those from the other rotations. Dry-land-grown potatoes were similar in composition to those from short rotations. The data suggested that crop conditions favoring high yields, as irrigation combined with long rotations and manuring, do not impair the value of the tubers for seed.

Light intensity as an inhibiting factor in the fixation of atmospheric nitrogen by Manchu soybeans, F. S. ORCUTT and E. B. FRED (*Jour. Amer. Soc. Agron., 27 (1935), No. 7, pp. 550–558, figs. 3*).—Inoculated Manchu soybeans grown at the University of Wisconsin in nitrogen-free sand under the normal high light intensity of early summer failed to initiate the process of

nitrogen fixation, but partial shading for 1 week brought the plants out of this fixation lag period. It appeared that this was correlated with the carbon-nitrogen relation within the plant. A high negative correlation between the carbohydrate level and nitrogen fixed was indicated. Conclusions were that an extremely high carbon-nitrogen ratio in the plant inhibits nitrogen fixation similarly to the inhibition observed with extremely low carbon-nitrogen ratios.

Effect of soil temperature and depth of planting on the emergence and development of sorghum seedlings in the greenhouse, J. H. MARTIN, J. W. TAYLOR, and R. W. LEUKEL (*Jour. Amer. Soc. Agron., 27 (1935), No. 8, pp. 660–665, fig. 1*).—In sorghums the percentage and rapidity of germination were reduced by soil temperatures below 25° C. and slightly reduced by deep planting (2.5 in.). Seedling development was retarded by lower soil temperatures within the range from 35° to 15°, and by deep planting at 15° soil temperatures but not at higher temperatures. The coleoptile of sorghum seedlings was longest in varieties producing large seedlings and was increased slightly by deep planting and low soil temperatures. The length of the subcrown internode varied directly with the depth of planting and was increased by soil temperatures above 25°. At high soil temperatures, many seedlings formed crowns above the soil surface. The most crown roots generally came from shallow planting at high soil temperatures and the most subcrown rootlets from deep planting at high soil temperatures.

Effects of freezing temperatures on sugarcane in the Florida Everglades, B. A. BOURNE (*Florida Sta. Bul. 278 (1935), pp. 12, figs. 3*).—Weather records discussed in relation to deterioration of sugarcane after freezing weather in the Everglades during the 1934–35 crop season indicated that the probability of such low temperatures, 27° and 21° F., occurring as early as December 11 and 12 would be about once in 50 yr. or longer. Deterioration curves for P. O. J. 2725 and other sugarcane varieties showed similar trends, the rather slow deterioration of P. O. J. 2725 approximating 0.017 percent 96° yield per day. Even when the cane reached the mill, 75 days after freezing, no trouble was experienced from decomposition of frozen cane and formation of mannite, dextran, and acetic acid.

The core-punch method used for field sampling large areas of cane during the season is described as rapid and accurate.

Fertilizer experiments with sweet clover, F. S. PRINCE, P. T. BLOOD, T. G. PHILLIPS, and G. P. PERCIVAL (*New Hampshire Sta. Circ. 47 (1935), pp. 12, fig. 1*).—Good yields of sweetclover were obtained on old hay and pasture soils in three localities where its lime and fertilizer requirements were satisfied. The varied behavior of the crop in response to lime, manure, and commercial fertilizers on the soils in the different localities are detailed. Trials in establishing sweetclover in old pastures by different tillage methods after using lime and superphosphate demonstrated that the resulting stand was almost in direct proportion to care in seed bed preparation. Seed from Ohio, Michigan, Alabama, and Canada all proved winter hardy, but northern-grown seed matured earlier at the station.

Primary considerations in developing new wheats in Washington, E. F. GAINES (*Northwest Sci., 9 (1935), No. 2, pp. 8–12*).—The history of wheat improvement at the Washington Experiment Station is reviewed, with remarks on important productions and their characteristics, work in progress, and future plans. Outstanding improvements have been in greater winter hardiness, stiffer straw, higher yielding ability, nonshattering chaff, and smut resistance. In certain restricted areas wheats particularly adapted to escape frost and hot winds have been emphasized. Within the last decade Albit

has become the leading winter wheat and Federation the leading spring wheat in large sections of the western territory, Early Baart the leading dry-land spring wheat, Turkey the predominating winter wheat in the drier areas, and Dicklow, Federation, and Jenkin leaders under irrigation.

Correlations between commercial and laboratory milling tests, C. H. Bailey and M. C. Markley (*Cereal Chem., 10 (1933), No. 6, pp. 515–520; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 59, 60*).—Statistical studies were made on duplicate 100-bu. aliquots of 40 lots of wheat of the 1930 crop milled in the commercial type mill of the Minnesota State Testing Mill and on 2,000-g portions of the same wheat lots milled in duplicate in small laboratory experimental mills at the Dominion Grain Research Laboratory at Winnipeg and at the Minnesota Experiment Station. The generalized probable error for a single milling test, in terms of percent yield of straight flour, for the commercial type mill was 0.36 percent and for the small experimental mill operating without humidity control 1.04 percent. While methods used in calculating the experimental milling yield influenced the magnitude of correlations somewhat, in general the correlation between flour yields of commercial and experimental milling tests upon portions of the same wheat lots approximated $r=0.6$. Correlations between flour yields in the two laboratories using small mills were about $r=0.5$, depending somewhat upon the method of calculation.

Dry applications of chlorates, H. W. Hulbert and L. V. Benjamin (*Idaho Sta. Circ. 74 (1935), pp. 8*).—Experiments aimed at the control of such perennial weeds as wild morning-glory, quackgrass, leafy spurge, Canada thistle, and whitetop (E. S. R., 72, p. 476) showed that chlorates are applied more effectively in the fall than in the spring or summer in weed control in Idaho. Dry chlorate treatments applied to the soil were as effective as sprays, were applied more cheaply, and were best made by hand broadcasting. Many weeds were killed better when the chlorates were applied in two treatments a few weeks apart. Removal of top growth by mowing and otherwise effectively supplemented the action of the chlorates. A lesser fire hazard of chlorates when applied in the dry form is indicated.

HORTICULTURE

[Horticulture at the Kentucky Station] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 33, 34, 35–37, 61*).—The following studies are briefly discussed: The effect of minerals applied to the soil on the composition of squash fruits; effect of copper on corn, tomato, spinach, and petunia plants growing in sand cultures; variety tests of vegetables; relation of the time of sowing tomato seed and the handling of the young plants to the maturity of the crop; drainage and soil management studies with peaches; effect of bordeaux mixture on fruiting and growth of raspberry plants; value of stable manure and sulfate of ammonia for raspberries; and cover crops for apples growing at the Western Kentucky Substation.

[Horticultural breeding studies at the Minnesota Station] (*Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 7, 8*).—Brief mention is made of the development of a watermelon adapted to northern conditions, the Parker pear introduced from Manchuria, the Flame crab apple, and the Hiawatha chrysanthemum.

Water, soils, and plant growth, G. H. Nesom (*Minn. Hort., 62 (1934), No. 4, pp. 65, 68, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 89, 90*).—Discussing the water requirements of plants, particularly horticultural plants, the author points out that the texture of the soil is a very important property in determining its use and crop-producing power. In general the best soils for horticulture are said to be those of medium texture or fineness. The addi-

tion of organic matter tends to increase the water-holding capacity and to make heavy soils more permeable to water.

Onions in the Connecticut Valley, A. B. Beaumont, M. E. Snell, W. L. Doran, and A. I. Bourne (*Massachusetts Sta. Bul. 318 (1935), pp. 31, figs. 9*).—This paper presents the results of cultural, fertilizer, propagation, breeding, insect control, and other investigations with onions.

On soils of pH 5.3 liming was distinctly beneficial. Two tons of ground limestone applied in two 1-ton lots increased the yields an average over 3 yr. of 35 percent. The optimum pH reaction for onions was between 6 and 6.5. In mixed fertilizer applications the greatest response was obtained from increases of phosphorus. The application of part of the nitrogen as a side dressing later in the season benefited seed onions but not onions from sets. Onions from seed responded best to a 4–12–8 mixture with half the nitrogen in organic form, used at the rate of 2,500 lb. per acre. In equivalent amounts double strength materials proved as effective as single strength. Muriate of potash was as satisfactory as sulfate as a source of potash.

With the exception of redtop, cover crops seeded among onions about the last week of July depressed yields slightly and in all cases added to the labor of harvesting. In comparisons of 3.5, 4.5, and 6.85 lb. of seed per acre the maximum yields were secured with the most seed, but there was a higher percentage of small onions. A 13-in. spacing between rows was found as good, if not better, than 15 or 18 in. As to size of sets, those below 0.75 in. in diameter were most satisfactory because they did not form many premature seed stalks. Sets below 0.5 in. were too small. Good sets were produced by sowing 50 lb. of seed per acre in rows 2 in. apart with the soil fertilized with 500 to 1,000 lb. of good fertilizer. Selection and breeding had yielded several promising strains but none of commercial importance.

Onion thrips were found to breed rapidly in set onions and to migrate from the sets to seed onions, making desirable the segregation of the two types. Onions with upright growth and an open habit possessed resistance to thrips. A fungus was observed in some years to attack thrips, but its usefulness was dependent on favorable weather. A nicotine soap spray proved most successful of all materials tested.

Effects of freezing and cold weather on immature onions, R. Magruder and L. R. Hawthorn (*U. S. Dept. Agr. Circ. 355 (1935), pp. 12, figs. 2*).—A group of 55 strains representing 20 varieties of onions being grown at Winter Haven, Tex., as part of a project on onion variety standardization carried on cooperatively with the Texas Experiment Station, was subjected in early February to minimum temperatures of 18°, 21°, 34°, 26°, and 32° F. on 5 successive days. Observations in early May showed higher mortality in the Yellow Bermuda, Crystal Wax, California Early Red, Italian Red, Extra Early Yellow, Prizetaker, and Sweet Spanish varieties than in the domestic varieties such as Southport White Globe, Southport Yellow Globe, Southport Red Globe, and Yellow Globe Danvers. Crystal Wax produced the largest percentage of doubles, and, in general, the flatter varieties produced a greater percentage of doubles than the round-bulbed varieties. Multipliers were most prevalent in Yellow Bermuda and Italian Red strains. Premature seed stalk production was very small in all varieties, Crystal Wax having the only appreciable number. Differences in response of strains within a single variety indicated that resistance to freezing and doubling are partially genetic and worthy of consideration by onion breeders. Certain data recorded by C. L. Isbell, of the Alabama Experiment Station, on resistance of onion varieties to low temperature are incorporated.

Forcing rhubarb, F. A. KRANTZ (*Minn. Hort., 57 (1929), No. 11, pp. 345, 346; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 77, 78*).—Although stalks of rhubarb produced at a temperature of 50° F. have more red or dark pink color, 59° is recommended as the most desirable temperature, considering both yield and rapidity of growth. An exposure of roots to a temperature of 20° for 2 weeks prior to forcing is said to be sufficient for stimulating growth. At −10° roots were injured and the yield reduced.

Effect of temperature on pollen germination and tube growth in the tomato, O. SMITH and H. L. COCHRAN (*[New York] Cornell Sta. Mem. 175 (1935), pp. 11, figs. 7*).—Bonny Best tomato plants with flower buds developing were placed in chambers held at constant temperatures of 50°, 70°, 85°, and 100° F., with relative humidities above 80 percent in all four cases. Emasculated blossoms hand pollinated at the time that normal flowers were fully open were collected at 6-hr. intervals after pollination and studied anatomically.

The best germination of pollen occurred at 85°, with 70° almost as favorable. At 50° germination was low and at 100° exceedingly poor. The maximum growth rate of pollen tubes occurred at 70°, with 85°, 50°, and 100° ranging in decreasing order. Germination percentage tended to increase on styles that received a lesser number of pollen grains. Although the rate of germination at 70° was slower than at 85° during the first 6- to 12-hr. periods, the pollen tubes at 70° grew more rapidly after that period. Temperature had a profound effect upon length of pollen tubes, many attaining the length of 4 to 6 mm in the 70° chamber, whereas at 100° none exceeded 2 mm. From a practical standpoint the results indicated that 70° and 85° are favorable temperatures for tomato pollination.

The effect on the tomato plant of carbon dioxide produced by combustion, B. D. BOLAS and R. MELVILLE (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 1–15, figs. 7*).—At the Experimental and Research Station, Cheshunt, England, greenhouse tomatoes supplied with gas produced by burning paraffin in a pressure burner yielded 23.9 and 13.9 percent more fruit in the first half and in the entire season, respectively, than did control plants. The time of the onset of ripening was the same in both groups, and no difference was noted in the susceptibility of the plants to mildew. The growth of tomato seedlings was also significantly increased by the treatment.

Winter injury in 1934, F. H. BEACH (*Ohio State Hort. Soc. Proc., 68 (1935), pp. 104–111, figs. 4*).—Information is presented on the relative susceptibility of different varieties of apples and peaches to low temperature injury and on the types of injury and methods of treating damaged trees.

Some things we know about nursery and orchard stocks, T. J. MANEY and H. H. PLAGGE (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 49–58, figs. 4*).—Discussing understock problems, in a contribution from the Iowa Experiment Station, the authors point out that in a commercial orchard planted at Woodbine, Iowa, in 1893–94 Grimes Golden, Gano, and Jonathan double-worked on Virginia crab, Haas, and Sheriff have lived longer than the same varieties on French crab roots. From the general experience of fruit growers in the Middle West, topworking on hardy stocks is said to be conducive to vigorous development, long life, and productiveness.

New varieties of fruits of interest to Iowa nurserymen and orchardists, H. L. LANTZ (*Iowa State Hort. Soc. Rpt., 69 (1934), pp. 181–188*).—Among new fruits discussed in this contribution from the Iowa Experiment Station are Sharon, Joan, Hawkeye Greening, Secor, Turley, Haralson, and Edgewood apples; Polly, Viceroy, Vaughn, Vedette, and Valiant peaches; and Patten, Parker, and Mendel pears.

Soils in relation to fruit growing in New York.—VI, Tree behavior on important soil profiles in the Williamson-Marion area, Wayne County, J. OSKAMP ([*New York*] *Cornell Sta. Bul. 626* (*1935*), *pp. 29, figs. 18*).—This, the sixth in a general series (E. S. R., 72, p. 744), discusses the results of studies in orchards the majority of which ranged from 50 to 60 yr. of age and consisted largely of Baldwin and Rhode Island Greening varieties. The methods of studying the soil and of root distribution were essentially the same as employed in an earlier study (E. S. R., 70, p. 47). On a given soil type the Baldwin and Rhode Island Greening trees were very similar in average trunk girth and depth of rooting. A comparatively few observations on Montmorency cherries indicated that this species responds to soil conditions in much the same manner as does the apple.

Among the several soils under observation the Alton and Palmyra gravelly loams, similar in tree response, appeared well adapted to orcharding, as indicated in yield, depth of rooting, and size of trees. Dunkirk silt loam produced the largest trees of all, as indicated in trunk girth, and the yields were also satisfactory. The Lucas loam, a variation of Dunkirk, also gave good results. Tyler, Livingston, and Lockport soils were definitely low producing. Ontario loam of the well-drained phase was above the average, but poorly drained phases gave low yields. Worth loam, similar to well-drained Ontario, was found valuable for apple growing.

On the whole, except where a rocky substrata caused shallow rooting without impeding drainage seriously, most of the unfavorable soil conditions were related to slow drainage and waterlogging. Excess water for any considerable period was associated with the development of gray and highly mottled horizons. On the other hand, soils of uniform brown-colored profile were generally favorable to fruit production.

Investigations in pruning mature apple trees, J. OSKAMP ([*New York*] *Cornell Sta. Bul. 624* (*1935*), *pp. 42, figs. 19*).—Pruning studies with Baldwin and Rhode Island Greening apple trees in an orchard, established at Hall, N. Y., in 1897 but still in vigorous condition with trees not crowding one another in 1933, led to the general conclusion that rather severe pruning has not influenced to a marked degree either yields or size, color, or freedom from blemishes of the fruit. Yield records available for 4 yr. for the Baldwin and 3 yr. for the Rhode Island Greening prior to the pruning treatments aided in grouping the trees and interpreting the data. In the Baldwin variety it became apparent that a single pruning, pruning in two consecutive years, or even three prunings with intervening no-pruning years have had no measurable effect on yields over a period of years. There was a tendency for pruning to disturb the sequence of heavy and light fruiting in Baldwin, with little effect in this direction in Rhode Island Greening. Pruning increased the size of the fruits in both varieties, in the Baldwin mainly in the year of pruning. Pruning had no consistent effect upon the color of Baldwin apples. Rather wide variations in girth increment noted from year to year were associated with size of crop, climatic conditions, etc., but to no important degree with pruning treatments. Considerable deadwood was observed in unpruned trees, evidence of natural pruning in densely shaded trees. In general conclusion the author suggests that pruning every other year, preferably in the heavy crop year, or even every other heavy crop year, may be sufficient to keep apple trees in good condition.

Stock-scion chemistry and the fruiting relationships in apple trees, H. L. COLBY (*Plant Physiol.*, *10* (*1935*), *No. 3*, *pp. 483–498*).—The roots and tops of young Whitney, McIntosh, Fameuse, Northern Spy, and Wealthy apple trees worked on Malling IX and XII understocks were studied at the University

of Wisconsin with relation to the presence and movements of various nutrients. The roots of trees on the Malling IX understock were well supplied with starch, fat, and nitrogen reserves, indicating that the graft union had not prevented the downward movement of foods. On the other hand, upward movement from the roots to the shoots in early summer was apparently impeded, probably as a result of early cyclic suberization of the small roots, thus limiting the water supply. In the case of Fameuse on Malling IX, where little dwarfing occurs, there was a free upward movement. This was also true in the case of trees on Malling XII.

In double-worked Whitney trees, with an intermediate stem piece of Fameuse there was a free upward movement of starch in early summer. On the other hand, when the intermediate piece was Malling IX, Whitney on seedling understocks was limited in development. An examination of the shoots of very fruitful trees on Malling IX showed an early accumulation of starch as compared with vegetative unfruitful trees on Malling XII. Malling IX trees exhibited a marked lack of apical dominance, the body of the tree being rather high in nitrogen while the shoots were low. Among factors other than understocks concerned in varietal fruitfulness may be inherent photosynthetic and respiration rates, hormones, degree of apical dominance, and suppression of spur growth.

A study of the factors affecting the development of the embryo-sac and the embryo in the McIntosh apple, L. R. Bryant (*New Hampshire Sta. Tech. Bul. 61 (1935), pp. 40, figs. 55*).—With both self- and cross-unfruitfulness important considerations in the McIntosh apple, this study was initiated to determine the effect of pollen tube growth on the length of time the egg remains functional previous to fertilization and the development of embryo and endosperm following fertilization. All of the four pollens used, namely, McIntosh, Gravenstein, Baldwin, and Delicious, retarded the breakdown of the embryo sac nuclei in McIntosh flowers. The earliest degeneration was observed in the Gravenstein cross and the latest in the Delicious. The development of female gametes was also stimulated by pollination and pollen tube growth. In all cross-pollinated flowers examined pollen tubes were found in the embryo sacs before degeneration of the egg nucleus began. In pollinations where fertilization did not occur the gametes persisted for some days—11 in the case of McIntosh×Delicious, and 13 with McIntosh×Gravenstein. There was an apparent correlation between the effectiveness of the pollen and the number and vigor of the gametes produced as well as the time and order of their appearance.

Zygotes were first observed 5 days after pollination in the McIntosh×Delicious combination and 7 days after pollination in the other crosses. Embryo development was most rapid in the McIntosh-Delicious cross, and very few aborting embryos were found in the flowers of this cross or in open-pollinated blooms on the nineteenth day after pollination (final collection). There was no indication that either low pollen germination or retarded pollen tube growth was the deciding factor in the poor results with Baldwin and Gravenstein pollens, the failure coming later when zygote development was stopped by embryo abortion. Attempts to explain the failure of self-pollination on the basis of lethal factors or other causes were fruitless.

Endosperm development was initiated at approximately the same time in all the crosses, yet the number of endosperm nuclei present and their distribution varied with the pollens. Endosperm growth was rapid in McIntosh×Delicious and in open-pollinated flowers and much slower in the other combinations. The greater stimulation observed to embryo development in com-

patible crosses was thus evident also in endosperm development. Practical applications of the results are discussed.

Polymorphism in the Belle de Boskoop apple [trans. title], V. A. EVREÏNOFF (*Rev. Hort.* [*Paris*], *107* (*1935*), *No. 19, pp. 465, 466, figs. 4*).—On individual trees there were observed two distinct types of fruits, one conical and the other oblate in shape and different also in color of the skin and in length of the stem. In addition there were noted two intermediate types. All four types possessed a common characteristic, namely, delicious flavor.

Handling of Jonathan apples for storage, F. GERHARDT and B. D. EZELL (*Idaho State Hort. Assoc.* [*Proc.*], *39* (*1934*), *pp. 51–56*).—Jonathan apples picked September 9 at 16 lb. pressure and October 3 at 13 lb. pressure and subjected, at the Wenatchee, Wash., laboratory of the U. S. Department of Agriculture, to a concentration of 35 percent CO_2 for 24 hr. prior to storage at 32° F. showed less than 1 percent and less than 5 percent, respectively, of soft scald on March 10. Immediate storage at 32° gave good control in the September 9 lot, but in the October 3 lot there developed 60 percent of soft scald by March 10. Delay in storage produced an excessive amount of soft scald even in the September 9 picking. A temperature of 36° was effective in reducing scald, and even in the October 3 lot there was at 36° less than 5 percent of scald on March 10.

Pear root concentration in relation to soil-moisture extraction in heavy clay soil, W. W. ALDRICH, R. A. WORK, and M. R. LEWIS (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 12, pp. 975–988*).—In this study, conducted cooperatively by the Oregon Experiment Station and the U. S. Department of Agriculture near Medford, Oreg., it was found by examining soil samples collected at different levels beneath large vigorous Anjou and Bartlett pear trees and from adjacent isolated cores without active roots that the relative rates of moisture extraction by roots at different levels and at different measured distances from the trunk are, in general, directly proportional to the relative concentration of small visible roots. Surface evaporation was found to be a factor only in the top foot. A positive correlation established between the amount of soil moisture extracted and the concentration of roots is said to indicate that the weight of small visible roots per unit volume of soil provides a measure of root area active in water absorption. It is recommended that for determining the irrigation needs of trees soil samples be taken from zones of relatively great root concentration. Concentration was not uniform throughout the soil, many small volumes containing no visible roots. Of the total moisture extracted from the upper 4 ft. there were in the 1-, 2-, 3-, and 4-ft levels, respectively, 34, 28, 22, and 16 percent. The relative concentration of visible roots in the corresponding zones were 36, 31, 22, and 11 percent. The most rapid moisture extraction by roots and also their greatest concentration was in the zone 2 to 8 ft. from the trunk.

Hand pollination of the pear [trans. title], K. NOBO (*Shizuoka* [*Japan*] *Agr. Expt. Sta. Bul. 33* (*1934*), *pp.* [*2*]+*16, figs. 13; Eng. abs., p. 16*).—Drying of anthers at 30° C. (86° F.) did not reduce the fertility of the pollen and facilitated its separation from the anthers. The amount of pollen produced was not correlated with size of anthers, which varied according to varieties. Honeybees preferred rape flowers to those of the pear.

The Polly peach, T. J. MANEY (*Iowa State Hort. Soc. Rpt., 69* (*1934*), *pp. 13–16, fig. 1*).—A brief account from the Iowa Experiment Station is given of the origin and characteristics of a new peach of the Champion type which is believed to possess greater resistance to low winter temperature than does Elberta and to be well suited to home orchards and roadside markets.

A varietal study of the susceptibility of sweet cherries to cracking, L. R. TUCKER (*Idaho Sta. Bul. 211 (1934), pp. 19, figs. 6*).—Of eight varieties of cherries under study, namely, Bing, Eagle, Lambert, Napoleon, Oregon, Republican, Tartarian, and Waterhouse, the Bing was found the most and the Eagle the least susceptible to cracking injury as determined by immersion for 10 hr. in tap water. There was a positive correlation between large size and tendency to crack, with no relationship evident between fruit firmness or the percentage of soluble solids and the tendency to crack. The only structural relationship that appeared correlated with cracking susceptibility was the calculated amount in cubic centimeters of skin per gram of soluble solids in the fruit; that is, the more skin produced per gram of soluble solids the less the tendency to crack.

Analyses of rainfall records for June and July in the Lewiston district indicated that late ripening varieties are exposed to appreciably less rainfall than midseason varieties during the period of susceptibility to cracking, suggesting the desirability of growing late varieties or early varieties resistant to cracking.

Hardiness and variety tests with some newer stone and small fruits, L. HAVIS (*Ohio State Hort. Soc. Proc., 68 (1935), pp. 120–124*).—Notes are presented on varieties of peaches, plums, raspberries, and strawberries tested by the Ohio Experiment Station.

Precooling investigations with deciduous fruits, F. W. ALLEN and L. R. MCKINNON (*California Sta. Bul. 590 (1935), pp. 142, figs. 54*).—A summary is presented of the results of a large number of precooling tests, some carried on under commercial conditions and others in the experimental cold storage plant at the university farm, employing various fruits, including the apple, apricot, cherry, nectarine, pear, plum, peach, and grape. Data are presented on effective temperatures, time required to accomplish cooling to the desired degree, and on the beneficial effects of precooling. A general discussion is presented of precooling in warehouse rooms and in refrigerator cars and of methods of shipping precooled fruit, etc.

New ideas in raspberry growing, W. G. BRIERLEY (*Minn. Hort., 59 (1931), No. 4, pp. 81, 82; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 80*).—Records taken at the Minnesota Experiment Station in 1928, 1929, and 1930 on the yield of Latham raspberry plants pruned to different heights showed increases in yield up to the maximum height employed, namely 5 ft. When portions of plants were dug and the roots placed in dye solutions it was found that at the height of the fruiting season the old canes colored more rapidly, but as time progressed the old canes gradually lost their greater efficiency in water production. At the close of the season (September 25) the rate of dye movement in the old canes had dropped to about one-half that of the new canes. Since the old canes were still taking up water at the end of the season, it is suggested that in light, droughty soils it may be advantageous to remove the old canes shortly after fruiting. On the other hand, in moist, heavy soils the water consumption on the part of the old canes might be a distinct asset.

A physiological study of development and ripening in the strawberry, C. W. CULPEPPER, J. S. CALDWELL, and H. H. MOON (*Jour. Agr. Res. [U. S.], 50 (1935), No. 8, pp. 645–696, figs. 14*).—Over a period of 4 yr. a total of 12 varieties of strawberries grown at Glenn Dale, Md., were studied at different stages of development from petal fall to full maturity with respect to various physical and chemical changes. The earlier samples were characterized by a very marked firmness and high solids content. Sugars were small in amount and usually made up only 30 to 40 percent of the soluble solids as compared with

70 to 80 percent in ripe fruit. The period of development up to the beginning of whitening was characterized by a progressive decrease in resistance to puncture and a decrease of total solids, insoluble solids, and astringent materials. Soluble solids decreased only slightly or showed practically no change. At the whitening stage the berries attained their maximum water content and their maximum titratable and active acidity. Soluble solids increased chiefly as a result of increased total sugars. The final change from white to red was accompanied by a rapid softening and a rapid decline in titratable acidity. Normally, the accumulation of water is said to be the dominant process up to whitening, with sugar accumulation most important from there on. It is pointed out, however, that environmental conditions often upset this balance.

On the basis of chemical analyses of ripe fruits, there were established ratios between acidity and astringency, acidity and sugar content, acidity and total solids, astringency and total solids, and total solids and sugars for the 12 varieties. Comparisons of these ratios permitted the grouping of the varieties into four groups: (1) A low-sugar, low-acid, low-astringency group consisting of Portia and Progressive, (2) a low-sugar, low-acid, high-astringency group made up of Aroma, Parsons, and Sample, (3) a medium-sugar, high-acid, medium-astringency group consisting of Dunlap, Howard 17, Gandy, Klondike, and Missionary, and (4) a high-sugar, low-acid, low-astringency group consisting of Chesapeake and New York. Of these groups the third is said to be the most nearly the type of chemical composition desirable in preserving berries.

Further investigations into the transport of bananas in Australia, E. W. Hicks and N. E. Holmes (*Aust. Council Sci. and Indus. Res. Bul. 91 (1935), pp. 35, figs. 10*).—With a view to determining the cause of spoilage in Australian bananas, temperature readings were taken on fruits still attached to the plant, after picking, and during transit. In the field the temperature of the fruits followed rather closely that of the surrounding air except where exposed to direct insolation. After packing, the temperature of fruits inadequately protected from the sun sometimes attained dangerous heights. After storage in the car the temperature usually declined fairly rapidly to that of the general level of the entire load. Bananas arriving in mixed ripe condition were found to have been loaded when too ripe. In winter the temperature sometimes declined below that necessary for the proper ripening, and this led to the suggestion of greater protection.

Detection and measurement of freezing injury in Valencia oranges, W. B. Davis (*Amer. Jour. Bot., 22 (1935), No. 5, pp. 559–566, figs. 7*).—With the aid of thermocouples connected with the usual Wheatstone bridge assembly, the resistance of the juice was determined in mature Valencia oranges held in a freezing chamber. The most striking feature of the frequency curves of resistance was the tendency in frozen fruits toward unsymmetrical flat types as compared with tall, symmetrical curves in unfrozen oranges. Undercooling proved to be a disturbing factor, making the time at which freezing occurred uncertain. Some records on navel oranges yielded curves quite similar to those for Valencia oranges. Although the calculation of coefficients was found somewhat tedious, the author believes that the frequency curves alone may prove sufficient for judging the degree of injury.

Some factors involved in the preservation of orange juice by canning, M. A. Joslyn and G. L. Marsh (*Fruit Prod. Jour. and Amer. Vinegar Indus., 14 (1934), No. 2, pp. 45–49, 56, 57*).—The deterioration of canned orange juice is said to be partly enzymatic in nature and to be markedly reduced by suitable heat treatments. Heating for 2 min. at 87.5° C. or 8 min. at 85° was required to destroy the pectic enzymes involved in clearing and clumping.

The flavor and keeping quality of orange juice varied with varieties and also with the locality where the oranges were grown. Irradiation with ultraviolet light was not found beneficial and in fact introduced off flavors. Orange juice deteriorated in storage, varying with the preparation process and with storage temperature. Enamel-lined cans were superior to plain tins, and certain enamels withstood attack during a storage period of approximately 1 yr.

Results of ten years' fertilizer experiments with pecans on Blanton fine sand and Bladen fine sandy loam, E. D. Fowler, J. J. Skinner, and R. W. Ruprecht (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 74–84*).—Conducted cooperatively by the U. S. Department of Agriculture and the Florida Experiment Station, these experiments showed that pecans growing in a light sandy soil (Blanton fine sand) benefited decidedly from applications of fertilizer. The greatest increment in trunk development occurred in the Moore variety on a plat receiving a 6–6–3 mixture, with ammonia all from cottonseed meal, and in the Schley variety on the 3–0–12 plat. Yields were highest in Moore on the 3–3–9 plat and in Schley on the 3–9–3 plat.

On Bladen fine sandy loam Curtis, Stuart, and Schley all made their greatest growth on the 9–3–3 plats. Curtis yields were highest on the 9–3–3 plat, Stuart on the 3–6–6, and Schley on the 6–3–6 plat.

The importance of maintaining vigorous terminal growth of pecan trees, A. C. Gossard (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 84–89*).—Observations by the U. S. Department of Agriculture on Schley, Stuart, and Success pecans growing in Mobile County, Ala., showed a well-defined relationship between growth and fruitfulness. Short, weak blooming shoots dropped most or all of their blossoms and nuts. Long shoots of one season were the most effective producers of fruitful shoots the succeeding year. In all three varieties the number of blossoms set and the length of shoots bearing them increased together. Also the average number of nuts matured per shoot increased with the length. The author believes that for the heaviest production pecan trees should be kept as nearly as possible in the same growth condition as young trees.

Time and duration of growth of several types of shoots in relation to fruiting performance of the pecan, F. N. Dodge and H. L. Crane (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 64–69, figs. 2*).—Studies made near Albany, Ga., by the U. S. Department of Agriculture showed that the most fruitful blossoming shoots of the pecan developed from preceding year's growth that was moderate in length, fairly thick at the base, and tapered very little from the base to the tip. Apparently the most rapidly growing and longest new shoots formed the most pistillate flowers and set the most nuts. No new strong shoots were produced from weak shoots of the preceding year's growth. Nonblooming shoots grew at a more uniform rate and continued growing longer than did blooming shoots. The most vigorous new shoots which formed the most blossoms and grew from the most vigorous parental shoots matured the most nuts. Strong shoots drop a greater number but a smaller percentage of their pistillate blossoms than do weak ones. The strongest shoots produced the largest and best filled nuts. In shoots of the same age the strong continued to be more fruitful than the weak. Pruning, nitrogen, and cultural practices which favored strong growth favored production.

Some of the influences of foliage on set and filling of the pecan, B. G. Sitton (*Natl. Pecan Assoc. Proc., 32 (1933), pp. 89, 90*).—In U. S. Department of Agriculture studies near Shreveport, La., it was found that less than four compound leaves per nut on August 1 resulted in unsatisfactory filling and that six or more leaves were required to produce nuts of fair to good quality.

On the four or less leaved branches, the initiation and development of pistillate flowers the succeeding spring was reduced. Later defoliations had progressively less influence on filling of nuts, but the formation of pistillate blooms was reduced even with defoliation as late as the middle of September. Partial defoliation of the blooming shoots about May 1 increased the abscission of blooms.

Some factors influencing the rooting of cuttings of the Chinese holly (Ilex cornuta), C. C. Thomas (*Natl. Hort. Mag., 14 (1935), No. 3, pp. 276-279, figs. 2*).—In a series of tests, including variations in media, types of cuttings, and time of taking cuttings, the best results were secured with nodal cuttings taken in July and placed in a medium of equal parts of peat and cinders.

FORESTRY

Studies in tolerance of New England forest trees.—XII, Effect of thinning in plantations on some of the physical factors of the site and on the development of young northern white pine (Pinus strobus L.) and Scotch pine (Pinus silvestris L.), W. R. Adams (*Vermont Sta. Bul. 390 (1935), pp. 156, figs. 26*).—This paper, the twelfth in a general series (E. S. R., 72, p. 55) and presented also as a doctorate dissertation at Yale University, discusses the effects of thinning on various ecological factors in the plantation and on the growth of white and Scotch pines planted in 1909 and 1911, respectively, in an open pasture. In the case of 20-year-old white pines spaced 4 by 6 ft., the removal of 45 percent of the basal area resulted in an increase in the solar radiant energy, wind movement, evaporation in the crowns and at 8 in. above the soil, the amount of precipitation reaching the soil, the available soil moisture to a depth of 3 ft. during periods when soil moisture was low, and in the soil temperature at 6- and 18-in. depths. The influences exerted on air temperature and relative humidity were so slight as to be considered negligible. Thinning stimulated diameter growth and total volume production in the trees of largest diameter and best form, but had no effect on the quality of the wood produced, as indicated in specific gravity measurements.

In the case of 18-year-old Scotch pines spaced 5 by 5 ft., the thinning removed 30 percent of the basal area and brought about similar but less marked changes in physical factors and in growth. At the close of the 4-yr. period following thinning there was still a beneficial influence of the treatment on tree growth in the white pine plantation, but in the Scotch pine area the reduction in growth rate of the selected trees was such as to indicate the need of another light trimming.

The methods used and the statistical formula employed in the analysis of the data are discussed in the appendix. A list of 179 citations to the literature is included in the bulletin.

Some factors influencing the yield and mortality of ponderosa pine in the Southwest, B. R. Lexen (*Jour. Agr. Res. [U. S.], 50 (1935), No. 9, pp. 777-787, figs. 7*).—An analysis of growth based on 93 1-acre plats on which records had been taken over a period of at least 15 yr. indicated that growth is closely correlated with reserved volume and the volume of the average tree, the index of multiple correlation being equal to 0.897. The net regression of reserved volume with growth was positive and curvilinear, and that of the volume of the average tree with growth was negative and curvilinear. Mortality proved to be a highly variable factor and showed only a slight relationship to reserved volume and the volume of the average tree. After a period of 15 yr. there was no conclusive evidence present to indicate that there would

be a decrease in mortality with time. Quantitative figures demonstrate that mortality is equal to approximately one-third the annual growth and that the standard error of the mean mortality for a 5-yr. period is approximately 10 bd. ft.

Catalase activity as a measure of viability of tree seeds, H. I. BALDWIN (*Amer. Jour. Bot., 22 (1935), No. 7, pp. 635–644, fig. 1*).—Catalase determinations upon white pine, Scotch pine, red pine, Douglas fir, Sitka spruce, and eastern hemlock seed, both in the dry state and following a few days' incubation in a Jacobsen germinator, showed a close relation between germinative capacity and the increase in catalase activity prior to germination. In most cases seeds shown by germination tests to be highly viable also showed a marked increase in catalase activity due to stimulation in the germinator. A quotient greater than unity, obtained by dividing the amount of oxygen evolved by stimulated seed with that evolved by resting seed, indicated high viability.

Composition of the leaves of some forest trees, F. J. ALWAY, T. E. MAKI, and W. J. METHLEY (*Amer. Soil Survey Assoc. Rpt., 15 (1934), pp. 81–84, figs. 2; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 75*).—Analyses of samples of leaves of nine species—basswood, Norway and silver maples, American elm, boxelder, green ash, and bur, white, and red oaks—collected at five dates from June 1 to October showed a seasonal increase in ash, lime, and magnesia and a decline in nitrogen, phosphoric acid, potash, and sulfur. With most constituents the changes were gradual until the time that the leaves dropped. Lime showed the greatest increase (137 percent) during the entire period.

Effect of fire on seedlings, G. S. PERRY (*Forest Leaves, 25 (1935), No. 3, p. 7*).—Studies of the germination and growth of Norway spruce and red and white pines planted in soil collected from severely burned areas and from adjacent areas where no fire had occurred for 13 yr. indicated that burned soils afford superior seed-bed conditions, particularly for white pine. In the pines there was a consistent but not marked tendency for top and root growth to be greater in the unburned soil. When the pots were subjected to artificial drought, more than five times as many seedlings perished in the burned soil. White pine was more drought resistant than either of the other two species.

[Forestry at the Kentucky Station] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 54–56*).—Brief reports are given of various improvement and fire prevention activities and of forest species tests at the Robinson Substation.

DISEASES OF PLANTS

Physiological studies of several pathogenic bacteria that induce cell stimulation in plants, J. A. PINCKARD (*Jour. Agr. Res. [U. S.], 50 (1935), No. 12, pp. 933–952, figs. 4*).—In this contribution from the Wisconsin Experiment Station, atypical and pathological stimulation of plant cells was investigated through comparative bacteriological and physicochemical studies of single-cell cultures, respectively, of the bacteria causing crown gall (*Phytomonas tumefaciens*), olive tubercle (*P. savastanoi*), oleander tubercle (*P. savastanoi nerii*), beet bacterial pocket rot (*P. beticola*), and of an unnamed bacterium causing overgrowths on black raspberry canes. *P. tumefaciens* proved pathogenic on all hosts used, *P. savastanoi nerii* on oleander and olive only, and each of the others only on the hosts from which isolated.

The common bacteriological tests used proved differential for all except the olive knot and oleander organisms, which showed similar characters. The optimum temperature for colony diameter on agar was about 28° C. for all

except *P. beticola*, which grew best at 32°. Oxamide, *l*-tyrosine, and *l*-cystine were the only nitrogen sources used in which all distinctly produced similar reactions, and these were in the acid range. Likewise, starch, pectin, phloridzin, and the sodium salts of certain organic acids were the only sources of carbon used in which all distinctly produced similar reactions, and these were in the alkaline range. In liquid media growth was prevented at from pH 3.6 to 4.4 and from approximately pH 9.5 to 10.5.

Quantitative determinations were made of reducing substances left after fermentation in cultures containing reducing sugars, some of the cultures showing similar, others unequal, utilization. In some cases little or no loss of sugar was detected by analysis, although sugar fermentation was indicated by turbidity and by change in reaction.

The inability of certain of these organisms to utilize several of the carbon- and nitrogen-containing compounds used was not due to unfavorable oxidation-reduction intensities of the media at H-ion concentrations approaching neutrality. The H-ion concentration of the sterile yeast extract-glucose-mineral salts liquid medium had a marked influence on its oxidation-reduction intensity, strong acid reactions being accompanied by relatively strong oxidizing potentials, either or both of which may have limiting or unfavorable influences on growth in the extreme acid region.

Oxidation-reduction-potential measurements made at frequent intervals with various growing cultures in a yeast extract medium showed that all produced relatively strong reducing potentials in undisturbed liquid cultures and in opposition to the oxidizing action of acid metabolic products.

The similarities of these organisms are discussed in relation to their comparative physiology and to its bearing on certain working hypotheses as to the cause of atypical and pathological multiplication of plant cells.

Serological evidence in plant-virus classification, K. S. CHESTER (*Phytopathology, 25 (1935), No. 7, pp. 686–701, figs. 2*).—A description is given of technics making possible the preparation of immune sera for a considerable number of strains and distinct types of plant viruses. In the present paper the precipitin and the complement-fixation technics are particularly concerned, and these have been applied to some 40 strains and distinct types of plant viruses in approximately 10,000 individual tests.

The tests show the following virus types to represent distinct serological entities: Tobacco mosaic, latent mosaic of the potato, potato mild mosaic, potato aucuba mosaic, potato vein-banding virus, tobacco ring spot, and Osborn's pea-mosaic virus No. 2.

From tobacco mosaic have been derived many strains of very close affinity serologically, although of very diverse symptomatology. The group of such uniformly interreactive viruses includes tobacco aucuba mosaic, Johnson's yellow tobacco virus VI, Holmes' symptomless tobacco mosaic, and many of Jensen's brilliant yellow, white, and slow-moving types.

The latent-mosaic virus of potato (=X-virus or healthy-potato virus) is representative of a group of serologically closely related virus strains embracing potato mottle, potato ring spot, and British Queen streak. According to the tests of Birkeland (E. S. R., 71, p. 202), spot necrosis and attenuated spot necrosis also belong to this group. Rugose mosaic virus of potato reacts with both X-virus and vein-banding sera, confirming the present view that it is a mixture of these two virus types.

The vein-banding virus of potato and cucumber-mosaic virus are so strongly interreactive that they appear to be but strains of the same virus type. This relationship is supported by infection tests. Valleau's tobacco virus 10729 also shows marked affinities with these viruses.

A much more distant serological relationship between tobacco mosaic and severe etch of tomato is indicated by precipitin tests.

Two viruses isolated from legumes by Osborn and tentatively referred to as pea-mosaic viruses No. 2 and No. 3 behave serologically as strains of the same virus type, although both are serologically distinct from all of the other viruses studied.

The usefulness of seric reactions in plant-virus classification has been confirmed by tests of numerous virus samples submitted as unknowns. The results of such tests have shown a sustained accuracy in identification by means of the precipitin test.—(*Courtesy Biol. Abs.*)

Relation of virus concentration to the number of lesions produced, W. J. YOUDEN, H. P. BEALE, and J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 7 (1935), No. 1, pp. 37–53, figs. 5*).—Several filtrable viruses of plants produce local necrotic lesions when rubbed on the leaves of certain hosts. The purpose of this study was to show that data at present available are not inconsistent with the concept that the number of lesions may be expressed as a simple function of the dilution and two constants, to each of which physical counterparts may be assigned. The data consisted of curves, taken from six different sources in the literature, showing lesion counts obtained by applying virus extracts to leaves in a series of dilutions. These curves included work with tobacco-mosaic, ring spot, cucumber-mosaic, and aucuba-mosaic viruses. The host plants used were *Nicotiana glutinosa*, *Phaseolus vulgaris* (Early Golden Cluster bean), and *Vigna sinensis* (Blackeye cowpea).

All these dilution curves have been satisfactorily fitted, using the relation $y=N(1-e^{-ax})$, in which y is the lesion count and x the concentration. The method of evaluating the constants is given and their possible significance discussed. The utility of the function as a guide to the design and interpretation of experiments is discussed and illustrated by examples.

The Plant Disease Reporter, July 15 and August 1, 1935 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 19 (1935), Nos. 11, pp. 156–195, fig. 1; 12, pp. 196–215, fig. 1*).—Among other items, these issues deal with the following matters:

No. 11.—A preliminary check list of the parasitic fungi on cereals and other grasses in Oregon, by R. Sprague (presenting the results of a cooperative investigation by the U. S. D. A. Bureau of Plant Industry and the Oregon Experiment Station in the form of a list of 146 host species and varieties with locality records).

No. 12.—Quince rust (*Gymnosporangium clavipes*) on apples in western Illinois, by H. W. Anderson; unusual developments of cedar rusts (*G. clavipes*, *G. nidus-avis*, *G. clavariaeforme*, *G. juniperi-virginianae*, *G. globosum*, and *G. biseptatum*) on pomaceous hosts (in Massachusetts) in 1935, by I. H. Crowell; incidence of bacterial wilt (*Aplanobacter stewarti*) in experimental plantings of sweet corn at Lafayette, Ind., in 1934, by G. M. Smith (presenting the results of field trials by the U. S. D. A. Bureau of Plant Industry in cooperation with the Indiana Experiment Station); and diseases of ornamentals and miscellaneous plants (reporting southern blight due to *Sclerotium rolfsii* on larkspur, Spanish iris, and on tung-oil tree (*Aleurites fordii*), all in Texas).

[Plant disease studies in Kentucky] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 10, 11–13, 28, 29, 37, 38*).—Brief reports are given of investigations on the hot-water treatment of tobacco seed, a study of 27 different strains of tobacco mosaic transmitted from perennial weeds, transmission of the vein-banding virus to tobacco from a potato field, the carry-over of tobacco mosaics by tobacco stalks disked into the soil, the study of 80 strains of tobacco mosaic on mosaic-

resistant tobacco, strain variations in the bacteria causing angular leaf spot and wildfire of tobacco, the development of tobacco varieties resistant to black root rot, sulfur deficiency of tobacco, crown rot of clover due to *Sclerotinia sclerotiorum* and *S. trifoliorum*, and spraying and pruning for the control of *Septoria* leaf spot of raspberries and prevention of cane die-back of dewberries.

Polarity, heredity, and variation in various species of Aspergillus [trans. title], P. Henrard (*Cellule, 43 (1934), pp. 349–424, pls. 6*).—This paper reports the results of a study of sexual polarity and various related problems in a score of species of *Aspergillus*, carried out principally by cultural and genetic methods which are described in detail. In all cases the strains used were obtained from single ascospores. Six new species are described.

All single-spore cultures of the "*glaucus*" series and of *A. nidulans* produced normal perithecia, thus demonstrating their strictly homothallic sexual nature. All single-spore strains of the same species were morphologically alike in the species studied.

Although sexually homothallic, *A. nidulans* proved to be physiologically bipolar or heterothallic. This bipolarity was shown only on juxtaposition of strains of opposite polarity. The origin and nature of this bipolarity is discussed, as well as their relations with the phenomena of true sexuality, and suggestions as to the directions of future research relative to the value and significance of sexual heterothally in general are indicated.

In a genetic study of five strains carried through several ascospore generations, the antagonistic character proper to their physiological class was demonstrated in four cases to be hereditarily constant in intensity and polarity. In the fifth strain the polarity was reversed in passing from F_1 to F_2, and this reversed polarity was maintained in F_3. The basis and value of this reversion are discussed.

A variant form ("imminutus") appeared repeatedly in single-spore cultures of *A. nidulans*, and all such cultures appeared to be capable of producing the same variant, which is described and compared with the original normal form. Since the exact origin of each of the mother strains was known, it was possible to establish all the conditions necessary for the appearance of the variant and to study the possible immediate causes of its origin. This variation proved stable through a certain number of transplantations, probably representing conidial "generations." However, since the perithecial stage failed to develop, it was not possible to determine whether the new character was transmissible by ascospores.

A second variant ("fertilior") of this species appeared once. Here the development of fertile perithecia permitted demonstration of the stability of the characters of the new form both in conidial and in ascospore generations. Therefore, this form may be considered definitely as resulting from a mutation.

In both of these variant forms the physiological bipolarity as found in the mother strains survived variation and mutation in spite of the profound morphological and physiological modifications involved. It is believed that these results clarify at once the nature of the heterothally and that of the variation.

The inheritance of resistance to flag smut (Urocystis tritici Koern) in ten wheat crosses, T. H. Shen (*Univ. Nanking, Col. Agr. and Forestry Bul. 17, n. ser. (1934), pp. 17; Chin. abs., p. 17*).—Ten crosses were made between (1) nearly immune varieties, (2) nearly immune and very susceptible strains, (3) nearly immune and susceptible strains, and (4) resistant and susceptible strains, and genetic studies were made of their F_2, F_3, and F_4 progenies. The results of the three most thoroughly studied crosses apparently indicated the existence of only three pairs of genes. Some of the nearly immune and resist-

ant strains carried not only resistant but also certain susceptible genes. Since transgressive inheritance was not uncommon, resistance tests are necessary even with crosses of two nearly immune or highly resistant varieties. The results of the study also indicated an independent inheritance of the genes for flag smut resistance, awnedness, and color and hairiness of the chaff.

The foot rots of wheat [trans. title], E. Foex and E. Rosella (*Rev. Path. Vég. et Ent. Agr., 21 (1934), No. 2-3, pp. 9-14*).—This paper reports the results of comparative studies of the behavior of 10 varieties of wheat and a number of species of cereal and grass plants toward attack by 5 species of foot rot or take-all fungi.

The 10 varieties of wheat (Bon Fermier, Alliés, Flècher d'Or, Oscar-Benoist, Inversal, Vilmorin 23, Vilmorin 27, Vilmorin 29, Hâtif inversable, and Hybride 40) were tested in the field against *Cercosporella herpotrichoides*, *Ophiobolus graminis*, *O. herpotrichus*, *Leptosphaeria herpotrichoides*, and *Wojnowicia graminis*. Only the first two parasites gave significant infections, and the percentage of diseased plants was, in a certain measure, inversely proportional to that of those killed. Though the percentage of infected plants and of losses in weight induced varied from a low figure to from 50 to 60 percent, an analysis of the data failed to offer any basis for a grouping of the varieties according to relative resistance.

The infection tests were repeated in the greenhouse in untreated v. steam-sterilized soil, where all inoculated plats were attacked and some of them very heavily. In general, the attacks were heavier in the sterilized than in the nonsterilized soil (possibly due to the antagonism of other micro-organisms in the latter), but the soil disinfection apparently caused no difference in the number of plants killed. In these tests all the varieties proved susceptible, infection being introduced at the soil surface or within from 1 to 2 cm below.

To determine whether other cereals and grasses may serve as hosts to these 5 fungi, various species of the following genera were inoculated: *Triticum* (11 species), *Avena* (9 species), *Hordeum* (10 species), *Aegilops* (3 species), *Lolium* (2 species), and *Secale* and *Phleum* (1 species each).

In the case of *C. herpotrichoides* (3 strains), all the species of *Triticum* were attacked, and also 5 of *Hordeum*, 3 of *Avena* (feebly), and *Secale cereale* (very feebly). None of the grasses were attacked. Thus, wheat and the other *Triticum* spp. appear to be the most susceptible hosts to this fungus, while barley appears to be less susceptible and oats least so.

The 5 strains of *O. graminis* used attacked all the species of *Triticum*, *Hordeum*, *Secale*, and *Avena* tested but in decreasing intensity in the order named. The very low susceptibility of oats as compared with wheat was confirmed by field observations in Morocco. Inoculations of *O. graminis* were also successful on species of *Aegilops*, *Lolium*, *Phleum*, *Festuca*, *Dactylis*, and *Bromus*, though some were only feebly attacked. Of greenhouse inoculations on *Zea mays*, *Sorghum* [*Holcus*] *halepense*, *S. vulgaris*, *Oryza sativa*, *Setaria germanica*, and *Panicum italicum*, only those on the last 2 species were successful. However, a saprophytic development was noted on old sheaths of *Sorghum halepense*. It is thus possible that *Ophiobolus graminis* may be able to maintain itself on sorghum stubble in the field.

W. graminis attacked very lightly the sheaths of *T. sativum* and *T. polonicum*, but caused no lesions on any of the other cereal or grass species tested.

Leptosphaeria herpotrichoides and *O. herpotrichus* caused no infections at all, but the cultures were old (1928) and probably attenuated.

Production of an artificial epidemic of wheat stem rust in Kenya Colony, C. A. Thorold (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 614-620, pl. 1*).—Four

physiologic forms of *Puccinia graminis tritici* are known in Kenya. The selection of resistant wheat varieties is hampered by the fact that only one or two of these forms may occur naturally in any 1 yr. A successful artificial rust epidemic, involving all four forms, was produced within the plat area devoted to wheat selection work. The method consisted in growing "surround" rows of susceptible varieties. Plants were inoculated with urediospores applied on a flat needle. For from 50 to 60 hr. after inoculation high humidity was maintained under a bell jar, or under a V-shaped glass cover when the plants could no longer be conveniently held under a bell jar.—(*Courtesy Biol. Abs.*)

Effect of temperature and light on development of the uredial stage of Puccinia graminis, L. W. Melander (*Jour. Agr. Res. [U. S.], 50 (1935), No. 11, pp. 861–880, figs. 5*).—The experiments were made in large, artificially lighted, constant-temperature chambers or in a large icebox cooled by a special refrigerating machine.

"Cold-hardened" urediospores of wheat stem rust (*P. graminis tritici*) and of timothy stem rust (*P. graminis phlei-pratensis*) retained their viability longer at temperatures below 0° C. than did nonhardened spores. At the humidities used, temperatures alternating above and below 0° were no more injurious to nonhardened urediospores of *P. graminis tritici* form 15 than constant subzero temperatures, but alternating temperatures killed more hardened spores after 9 days than did constant subzero temperatures. Moderately low temperatures lengthened the incubation period but did not change the infection type appreciably, although the uredia were somewhat smaller. It required approximately 1 week longer for uredia to appear on plants at 10° than at 20°. At very low temperatures the incubation period may be delayed almost indefinitely, although physiologic forms of *P. graminis tritici* and *P. graminis avenae* differed in their ability to develop at a temperature just above 0°. *P. graminis tritici* form 35 produced uredia after about 70 days at from 0° to 1°, but the uredia were very small, and those of *P. graminis tritici* form 15 produced what appeared to be type 1 infection instead of the type 3 or 4 normally produced at 20°. That this was not a true type 1, however, is indicated by the fact that when the plants were placed in the greenhouse at 20° the apparent type 1 developed into type 3. At very low temperatures there was a tendency for telia of certain forms to be produced earlier than under more normal conditions. The mycelium of at least some physiologic forms of stem rust withstood as low temperatures as did the host.

Low light intensity had a tendency to lengthen the incubation period, but under the conditions used the infection type did not differ appreciably at different light intensities, although the intensity and quality of the light apparently had some effect on the size and shape of the urediospores.

These studies indicate that temperature is the most important factor governing the development of rust in a susceptible host, assuming that there is sufficient moisture for infection and enough light for normal growth of the host.

Summary of investigations with Ustilago striaeformis parasitizing some common grasses, W. H. Davis (*Phytopathology, 25 (1935), No. 8, pp. 810–817*).—This paper presents a summary of 12 years' observations and investigations, together with the data here reported for the first time on the assemblage of species and forms known as *U. striaeformis* parasitizing *Phleum pratense*, *Agrostis alba*, *Dactylis glomerata*, *Poa pratensis*, and *P. annua*. From the results of these studies the following conclusions are drawn: The chlamydospores pass through an after-ripening period of about 250 days; the

life histories are known, and infection is initiated in the seedling; the type of spore germination showed that each smut belongs to the genus *Ustilago;* and a form of the smut is physiologically fixed to each host.

The smut on *D. glomerata* is described as *U. clintoniana* n. sp., and a physiologic form is assigned to each smut parasitizing the other four hosts, since the spores resemble the accepted type form parasitizing timothy and often called "timothy smut" in the literature. The following classification is suggested for the United States forms: *U. striaeformis* f. *phlei* on *Phleum pratense*, *U. striaeformis* f. *agrostidis* on *A. palustris*, *U. striaeformis* f. *poae-pratensis* on *Poa pratensis*, *U. striaeformis* f. *poae-annuae* on *P. annua*, and *U. clintoniana* on *D. glomerata*.—(*Courtesy Biol. Abs.*)

The constancy of cultural characters and pathogenicity in variant lines of Ustilago zeae, E. C. Stakman, L. J. Tyler, and G. E. Hafstad (*Bul. Torrey Bot. Club, 60 (1933), No. 8, pp. 565–572, pls. 2; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 56*).—An intensive study of monosporidial lines was made to determine the nature of variation (mutation) in *U. zeae*. That variants result from genotypic changes is indicated by the fact that a selected group of variant lines retained their distinctive cultural characters for more than 4 yr. There is evidence that the abundant production of new lines arising as sectors in colonies of monosporidial lines are due to mutation rather than delayed segregation. In general, successive sporidia budded from primary sporidia or from the same segment of the promycelium behaved like clones, although sporidia of opposite sex were sometimes isolated from the same promycelial segment and extremely abundant sectoring sometimes complicated the study of cultural characters. Apparently factors for sex and cultural characters usually are segregated in the same nuclear division. However, nuclear behavior in the promycelium does not follow rigid rules.

Results of extensive inoculations to determine whether chlamydospore collections, which comprise many biotypes, behave consistently like physiologic forms were somewhat inconclusive, although there sometimes were differences in the virulence of collections and in factors for sex and pathogenicity of the component biotypes.

Studies on bean rust caused by Uromyces phaseoli typica, L. L. Harter, C. F. Andrus, and W. J. Zaumeyer (*Jour. Agr. Res. [U. S.], 50 (1935), No. 9, pp. 737–759, figs. 4*).—This paper summarizes the results of 5 yr. of study in the laboratory and field. Evidence was obtained that the bean rust organism can be made to complete its full life cycle under greenhouse conditions, except for a nonteliospore-producing strain found prevalent in California. Attempts to force teliospore formation showed that the abundance of teliospores, as well as the time when they appear, may be controlled to an appreciable extent by altering host metabolism.

In longevity tests teliospores 207 days old and urediospores 182 days old were germinated. Urediospores showed a decrease in germinability with age, while teliospores gave a maximum germination after 6 mo.

A brief comparison is made of the bean rust with the cowpea rust (*U. phaseoli vignae*) and with a rust of *Strophostyles helvola*, which is probably a different, though closely related, species.

The optimum temperature for spore germination in bean rust was found to be about 14.5° C., the optimum for infection about 17°. No infection took place at a relative humidity below 95 percent. Infection seemed to require either moisture condensation or an initial excess of moisture on the plants at the beginning of the infection period. In a test on the influence of light, plants were sprayed with urediospores and confined in a darkened moist chamber for different periods, then removed to normal light. In those kept dark for from 24 to 48

hr. only, infection developed normally, but in those confined for longer periods the number of sori was reduced and their development delayed. The minimum time required for infection under optimum conditions was 8 hr., while from 12 to 18 hr. proved best. These results indicate that outbreaks of bean rust are possible in any region where a relative humidity of 95 percent or more is maintained for any period of 8 hr. or longer. Field records are given of temperatures and humidities in three important bean-growing areas of the United States and correlated with the epidemic occurrence of rust.

Data on the resistance and susceptibility of 60 varieties of garden and field beans, 15 varieties of lima beans, and the tepary bean indicate that while the tepary bean is moderately susceptible many varieties in the other groups have considerable resistance. The occurrence of more than one physiological form of bean rust is recorded for the first time. Preliminary tests gave some evidence of effectiveness in control by dusting sulfur but not by copper-lime dust. The development and use of resistant varieties, however, is held to provide a more practicable solution for the problem.

Histological studies of Wisconsin Hollander and Wisconsin Ballhead cabbage in relation to resistance to yellows, M. E. ANDERSON and J. C. WALKER (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 10, pp. 823–836, pls. 2, figs. 2*).—In a cooperative investigation between the University of Wisconsin and the U. S. D. A. Bureau of Plant Industry, three strains of cabbage, all selections from the variety known as "Hollander" or "Danish Ballhead" but differing in their resistance or susceptibility to the cabbage yellows organism (*Fusarium conglutinans*), were studied in their relations to the pathogen. One of the Hollander strains proved very susceptible; one (Wisconsin Hollander) was intermediate in resistance, and previous studies had shown that its type of resistance had a complex genetic basis and was not expressed at high soil temperatures; and the third (Wisconsin Ballhead) was completely resistant up to 26° C., and the resistance was governed by a single dominant gene.

Plants were inoculated on agar plates and in infested soil, the root and hypocotyl were fixed at various intervals, and the progress of the parasite was studied in stained sections. The fungus entered all three strains similarly by invasion of the root tip and the cortex of the root or hypocotyl, penetration apparently being accomplished by mechanical pressure. Penetration of the highly resistant Wisconsin Ballhead roots occurred frequently, but was generally limited to the outer cortical cells or the lower root-tip region and very seldom reached the vascular system. In the intermediate resistant strain the pathogen was retarded, but not to the same extent as in Wisconsin Ballhead. Invasion of the vascular system occurred commonly, but the fungus was usually localized in a few vessels. In susceptible plants invasion of the cortex and stele was rapid and extensive.

"Only in Wisconsin Ballhead was intercellular suberization of cortical cells in advance of the fungus noted. Suberization of endodermis and pericycle walls often occurred locally in both Wisconsin Ballhead and Wisconsin Hollander when these tissues were approached by the fungus. Granulation of epidermal and outer cortical cells was noticeable in certain plants of Wisconsin Ballhead and Wisconsin Hollander when these cells were penetrated directly."

No definite morphological differences in structure or in protoplasmic reaction to the parasite which might account for resistance was noted among the three strains. Whatever the true nature of resistance may be, it is apparently not readily discernible by histological methods, and further knowledge regarding it may best be sought through a biochemical approach.

The present status of Stewart's disease or bacterial wilt of sweet corn, R. C. THOMAS (*Ohio Veg. Growers' Assoc. Proc., 19* (*1934*), *pp. 97–103*).—This

paper from the Ohio Experiment Station presents a brief general review of Stewart's disease [*Aplanobacter stewarti*] of corn, with special reference to its spread by insects, seed, and soil and to its control by seed treatment and by the use of resistant varieties. Reference is also made to a bacteriophage active against the parasite, which was found in soil from the roots and refuse of affected corn plants.

Comparing soil fungicides with special reference to Phymatotrichum root rot, W. N. Ezekiel and J. J. Taubenhaus (*Science, 79 (1934), No. 2061, pp. 595, 596*).—In this contribution from the Texas Experiment Station, pentachloroethane, tetrachloroethane, and xylene proved most effective in laboratory tests of the ability of various volatile chemicals to kill *P. omnivorum* after diffusing through soil. In a field test, tetrachloroethane killed the fungus on cotton roots (without injury to the cotton) to depths of 2 ft. when placed in holes 6 in. deep about the plants.—(*Courtesy Biol. Abs.*)

Studies in bacteriosis.—XXI, An investigation of marsh spot of peas, M. S. Lacey (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 621–640, pl. 1*).—A bacterial examination was made of the cotyledon lesions of 200 dried and of 200 green pea seeds attacked by marsh spot. Seventy percent of the cultures made from the lesions were sterile. The remainder yielded growths of micro-organisms of which the two predominating species were a spore-forming organism (*B[acillus] subtilis* or *B. mesentericus* type) and a small yellow rod (probably *B. herbicola aureum*), both frequently present on the exterior of pea seeds and in a few cases in the cotyledons of healthy peas. Inoculations of all the bacterial species isolated were made into seedlings and pods, invariably with negative results.

In tests with marsh spot seeds very badly diseased seeds failed to germinate, and in less severe cases the plumule frequently died, the growth being continued by lateral shoots. No evidence was obtained of any increase of marsh spot in the progeny from diseased as compared with that from healthy seeds grown under the same conditions. Pot-culture experiments relative to the effects of soil and of excessive moisture on the development of marsh spot invariably gave negative results.

In a microscopical and microchemical study here reported by B. J. Grieve no bacteria were found within the cells or in the intercellular spaces. Most of the cytoplasm had disappeared from the necrotic cells, leaving only the starch grains. There was no indication of the formation of a cork cambium between the healthy and the necrotic tissues. Suberin was present in the affected cell walls, and their pectic content appeared to be in the form of an insoluble pectic acid. There were apparently no differences in the degree of resistance of necrotic v. healthy cell groups to solubility in various reagents.

Potato diseases in Montana, H. E. Morris and P. A. Young (*Montana Sta. Bul. 300 (1935), pp. 49, figs. 24*).—This revision of Bulletin 227 (E. S. R., 63, p. 345) was preparerd chiefly for the use of growers. Added to the former discussion of the chief potato diseases and their control is a description of a type of physiological mottling of early-formed leaves which may not appear in those formed later. A key to tuber, leaf, and stem diseases is appended.

Four serious diseases of table and seed potatoes (scab, Fusarium wilt, Rhizoctonia, and early blight), R. W. Goss (*Nebr. State Bd. Agr. Ann. Rpt., 1934, pp. 619–624*).—This is a popular account based on survey work and investigations conducted in Nebraska by the Nebraska Experiment Station.

Rhizoctonosis of potatoes grown under irrigation, L. A. Schaal (*Phytopathology, 25 (1935), No. 8, pp. 748–762, figs. 2*).—When potatoes are grown in the cold soils of the mountain valleys and in the early-crop areas of Colorado, the stem lesions of rhizoctonosis (*Corticium vagum*) are the common type

of injury. Plantings made late in the season in the early-crop area near Greeley, Colo., were free from stem infection. Experiments indicated that heavy sclerotial infection on the tubers occurs with excess moisture and low soil temperatures, but excess moisture appears to be the most important factor in the formation of sclerotia on the tubers. Seed-tuber treatment proved to be of value in reducing the amount of *Rhizoctonia* infection on the tubers. Mercuric chloride treatment (1:1,000 for 1.5 hr.) was of more value than formaldehyde or any of the organic mercury compounds tested. A combination of seed treatment and careful handling of irrigation water during the last few weeks of tuber growth is suggested for the control of tuber infection in the irrigated areas of Colorado.—(*Courtesy Biol. Abs.*)

Potato spraying and potato scab, E. O. MADER and F. M. BLODGETT (*Amer. Potato Jour., 12 (1935), No. 6, pp. 137–142*).—This contribution from Cornell University reports marked reductions in the percentages of potato scab [*Actinomyces scabies*] obtained over a 2-yr. period in certain fields sprayed with bordeaux mixture. While the cause of such results cannot be explained with certainty, some observations on the effects of spraying on the growth, development, and chemical composition of potato plants suggests the following possible ways by which these results may have been induced. The delay in tuber setting and enlargement caused by spraying may have thrown these processes into a period of higher soil moisture, thus reducing the amount of infection. The tubers from sprayed plants were shown to have a higher total nitrogen and copper content, either of which may have influenced the incidence of infection. Reduction in the prevalence of flea beetles by spraying may have reduced the dissemination of scab by this means. Finally, sprayed plants wilted more than unsprayed plants under the prevailing hot, dry conditions, and this may have induced changes in the tubers rendering them more resistant to scab infection.

Potato tuber discoloration, P. E. TILFORD (*Ohio Veg. Growers' Assoc. Proc., 19 (1934), pp. 109–112*).—This paper from the Ohio Experiment Station briefly discusses potato tuber discolorations associated with frost injury, blackheart, wilt diseases (*Fusarium oxysporum* and *Verticillium alboatrum*), net necrosis, yellow dwarf, internal browning, root growth through the tubers, and stem-end browning.

Spinach seed treatment, H. T. COOK and J. A. CALLENBACH (*Virginia Truck Sta. Bul. 87 (1935), pp. 1211–1233, figs. 3*).—This bulletin summarizes the results of tests extending over several years on the control of the rotting of seeds and seedlings and damping-off of young plants of spinach by means of different seed treatments. The cause of most of the seed and seedling damage was apparently a species of *Pythium*. Red copper oxide, zinc oxide, zinc hydroxide, Semesan, Vasco 4 (containing zinc oxide and zinc hydroxide), and copper sulfate solution were compared for effectiveness in improving stands both in the greenhouse and in the field. Large increases in stands and yields resulted in connection with the early fall plantings, but in the later fall plantings good stands were obtained without the use of any treatment. Copper sulfate always caused a reduction in stand in the later plantings. In these in a wet fall red copper oxide produced no injury, but in a dry fall it caused injury.

Dusting the seed with either red copper oxide, Vasco 4, or zinc oxide is recommended on the basis of these tests as the most practical and effective treatments for improving the stand of spinach, from 1.5 to 2 percent of the dust by weight being used.

Studies on sugarcane mosaic in Louisiana, E. C. TIMS, P. J. MILLS, and C. W. EDGERTON (*Louisiana Sta. Bul. 263 (1935), pp. 39, figs. 7*).—For 15 yr. or

more the mosaic disease has been a very important factor in sugarcane production in Louisiana. In susceptible varieties it spreads rapidly in the southern part of the sugarcane area, but in the northern portions infection has consistently remained low. Two distinct and constant symptomatic types of the disease occur in the State—the "green" or mild and the "yellow" or severe types. In some cases both types occur on the same variety.

Sugarcane varieties have not always continued to show the same resistance to mosaic. For example, P. O. J. 213 and Co. 281 remained very resistant for years and then suddenly became very susceptible, as if a more virulent strain of virus had become established. The newer and more promising varieties are not immune. The yellow type occurs to a very limited extent in C. P. 28-11 and C. P. 28-19 and the green type in C. P. 29-320.

Some varieties may apparently recover, the mosaic symptoms gradually disappearing from mature plants in the field or disease-free shoots developing from known infected stalks. A very high percentage of infected plants of P. O. J. 213 and P. O. J. 228 recovered prior to 1931, when the former variety was considered to be very resistant, but later, after mosaic had begun to spread rapidly in P. O. J. 213, there was very little recovery. This again confirms the theory that a more virulent strain of the virus had become established. Among the newer varieties, recovery is common in C. P. 29-320 and C. P. 28-11 and sometimes occurs in C. P. 28-19. Infective virus is not always absent from apparently recovered plants. In some cases the disease was reproduced by inoculating juice from such plants, but the percentage of infection was low.

A slight reduction in the germination of the eyes, due to mosaic, was observed in Louisiana Purple, Louisiana Striped, D. 74, and possibly also in P. O. J. 213. No consistent reductions in stand were found in Co. 290 or Co. 281.

In field tests with the mosaic disease the losses in tonnage of the crop varied considerably. Details of the results with different varieties are given. The yellow-type mosaic induced higher reductions in yield than the green type.

Except for C. P. 28-70, there was no significant difference in the sucrose content of the juice from healthy v. infected cane in any of the varieties tested.

Over a period of 8 yr. satisfactory results have followed the spindle-puncture method of inoculation. In general, inoculation experiments were more successful during the early part of the growing season, when infection was readily obtained in most of the susceptible varieties. Later in the season, inoculations were not so successful in the ordinarily resistant varieties, but in the very susceptible ones infections were readily obtained. Stubble cane of some varieties is apparently less susceptible to artificial inoculation than plant cane. The incubation period in very susceptible varieties is generally shorter than in those showing some resistance.

Successful infections were obtained with viruses from plants showing either the green or the yellow type of symptoms. Both types of mosaic occur in the C. P. 28-70 variety, and viruses from infected plants have usually produced similar symptoms following inoculation into healthy plants of the same variety. The few exceptions to this were probably due to mixed viruses. Virus from Co. 281 plants showing green symptoms invariably produced the yellow-type mosaic when inoculated into C. P. 28-70. In selected strains of D. 74 and Louisiana Purple, which showed mosaic in very mild form, a pronounced form was produced by inoculating with a virulent virus.

In susceptible varieties mosaic spreads rapidly from the inoculated main shoot to the suckers. It also spreads from the suckers to the main shoot, though apparently less rapidly.

The results of this study suggest that there are a number of physiologically different sugarcane-mosaic viruses, and that they sometimes induce different symptoms, but in other cases are differentiated only by their ability to attack certain cane varieties.

Isolation of a crystalline protein possessing the properties of tobacco-mosaic virus, W. M. Stanley (*Science, 81 (1935), No. 2113, pp. 644, 645*).—A crystalline protein having the properties of tobacco-mosaic virus was isolated from the juice of mosaic-infected Turkish tobacco plants. In a fractional crystallization experiment the activity of the first small portion of crystals to come out of solution was the same as for the mother liquor. The material lost its activity and the protein became denatured when the solutions were made more alkaline than about pH 11.8 or more acid than about pH 1. The protein was completely coagulated and its activity lost on heating to 94° C. It was held back by collodion filters, readily allowing such proteins as egg albumin to pass, but readily passed through a Berkefeld W filter. Collodion filters holding back the protein also held back the active agent of mosaic. One cc of a 1–1,000,000,000 dilution of the crystals usually proved infectious, and the disease induced by this, as well as by more concentrated solutions, was typical tobacco mosaic.

The sera of animals injected with tobacco-mosaic virus gave a precipitate when mixed with a solution of the crystals diluted as high as 1–100,000, while the juice from healthy tobacco plants gave no such reaction. Injection of solutions of the crystals into animals caused the production of a precipitin active for solutions of the crystals and for the juice of plants containing tobacco-mosaic virus but inactive for the juice of normal plants.

The results lead the author to regard tobacco-mosaic virus as an autocatalytic protein which, for the present, may be assumed to require the presence of living cells for multiplication.

Studies on disease resistance.—I, A tobacco resistant to ordinary tobacco mosaic, J. A. B. Nolla (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 19 (1935), No. 1, pp. 29–49, pls. 8*).—The results of these studies indicate that, in the resistant Colombian variety of tobacco (*Nicotiana tabacum*) Ambalema, infection with ordinary tobacco-mosaic virus always occurs at all ages of the host if inoculations are properly done, the symptoms usually consisting in clearing of the veins followed by small chlorotic interveinal areas of a mild type. When inoculated at the time of pulling, mild or severe symptoms developed in the transplants, which later recovered in the field, but the virus was always present in their tissues, as shown by inoculation of the juices into *N. glutinosa* and Havana No. 38 tobacco.

The Ambalema variety also proved resistant to yellow tobacco mosaic and to celery mosaic, symptoms being produced but the effects of the disease presenting little significance. By quantitative studies it was shown that Ambalema tobacco is definitely more resistant to ordinary tobacco mosaic than Havana No. 38 at all growth stages. However, it proved very susceptible to cucumber mosaic, yellow cucumber mosaic, potato ring spot, Wingard's tobacco ring spot, and spot necrosis, and somewhat less susceptible to the mottle and vein-banding viruses.

The virus concentration was lower in inoculated Ambalema plants 9 weeks after inoculation (13 weeks old) than 5 weeks after inoculation (9 weeks old).

A mild form of mosaic virus was isolated from Ambalema plants inoculated with the ordinary tobacco-mosaic virus. In its properties it was apparently similar to the form inoculated. This apparently new virus thus may be explained as a case of attenuation.

A comparison of English and Canadian tomato virus diseases, G. C. Ainsworth, G. H. Berkeley, and J. Caldwell (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 566–580, pls. 3*).—This comparative study showed that the commoner viruses affecting tomatoes occur in both England and Canada.

Tomato streak caused by the same single virus occurs in both countries, but streak due to a mixed-virus infection appears to be more frequent in Canada than in England.

The following diseases, with their causal viruses, are described: Tomato mosaic (tobacco virus No. 1), yellow mosaic of tomato (tobacco virus No. 6), single-virus streak (tomato-streak virus No. 1), mixed-virus streak (a mixture of two or more viruses, generally a tobacco-mosaic virus or tomato-streak virus No. 1 with a potato virus of the X-type), and spotted wilt (spotted wilt virus). The presence of the last-named disease in Canada was not established.

Ring-mosaic virus and tobacco virus No. 9, which have not been recorded in England, are also described.—(*Courtesy Biol. Abs.*)

A comparison of certain English and Canadian potato viruses found infecting tomatoes, G. C. Ainsworth (*Ann. Appl. Biol., 21 (1934), No. 4, pp. 581–587, pl. 1*).—From comparisons of the potato viruses isolated from virus-diseased Canadian tomatoes with standard English material, it is concluded that the different viruses, which corresponded with mild and virulent strains of the "latent" or "healthy potato" virus, were all strains of potato virus X which differed primarily in virulence.

Immunity to a virulent strain of the virus was conferred on tomato plants by inoculation with a mild strain.—(*Courtesy Biol. Abs.*)

Review of fruit diseases in 1933, H. C. Young (*Ohio State Hort. Soc. Proc., 67 (1934), pp. 23–28*).—This contribution from the Ohio Experiment Station deals with *apple scab, cedar rust, bitter rot, apple-tree measles, and peach leaf curl* conditions in that State.

Fruit-rotting Sclerotinias.—IV, A cytological study of Sclerotinia fructicola (Wint.) Rehm, J. W. Heuberger (*Maryland Sta. Bul. 371 (1934), pp. 167–189, pls. 4, fig. 1*).—In continuation of investigations previously noted (E. S. R., 56, p. 748), this bulletin reports results of a cytological study of several life-cycle phases of *S. fructicola*, especially of the microconidia and apothecia, carried out to obtain data on the nuclear phenomena as throwing light on its sexuality.

The microconidia, here described, have a single nucleus and are produced in chains on bottle-shaped sterigmata. They are not pinched off from the tips of the sterigmata but become separated by the development of a septum in the neck region. The chief factor determining their production proved to be a limitation or lack in carbohydrate nutrition. However, production was more abundant at pH 5.5 and 7.9 than at pH 4.1. Light, temperature, and age of agar were not determining factors. The fact that microconidia occurred on the surface of mummies in late winter at the time the apothecial fundaments were developing just below the sclerotial surface may indicate that they spermatize these structures. This theory is further supported by the fact that not all apothecial fundaments develop into apothecia.

Three distinct types of nuclei were found in the life cycle: (1) Nucleus with a large, round, central nucleole surrounded by clear nucleoplasm, occurring in ascogenous hyphae, conidia, ascospores, and mycelium; (2) nucleus with one, two, or three small, round nucleoles lying against the nuclear membrane, with nucleoplasm slightly more dense than in (1), and occurring in the paraphyses; and (3) a crescent- or comma-shaped nuclear body, occurring in microconidia.

Asci developed from croziers formed by the binucleate tip cells of ascogenous hyphae.

No double reduction in the chromosome number occurred in the three divisions in the asci. It appears that reduction from the diploid to the haploid number must occur at the first division. The only nuclear fusion may be that occurring in the young ascus. The haploid chromosome number is four. No daily periodicity of the nuclear divisions in the asci was found.

Pear scab in the Hood River Valley, J. KIENHOLZ and L. CHILDS (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 65–69*).—Since 1932, pear scab [*Venturia pyrina*] has become a serious menace to fruit production in several sections of the Hood River Valley, Oreg. This paper summarizes 3 yr. of progress in a cooperative investigation on its control by the Hood River Substation and the U. S. D. A. Bureau of Plant Industry.

Primary infections were found to result from material overwintering on the twigs rather than on the leaves, but the spores developed here do not constitute a serious menace to control measures since any practice eliminating or checking their dispersal is effective. Certain sprays proved valuable in inhibiting this twig carry-over, and the caustic sprays were more effective than the wettable sulfur sprays. When the mild sprays were used for the earlier applications control of twig scab was less effective, but their substitution at a later date made less difference. Only the wettable sulfurs proved safe for use on Anjou pears. On varieties where fruit russet is not a factor and where scab is a serious problem, lime-sulfur or bordeaux mixture should be used. A combination of lead arsenate with lime-sulfur often caused serious defoliation, hence the former should be applied separately. Where more than 20 percent of the crop was scabby the previous season more difficulty in control was encountered, and the grower must determine whether probable scab increase or fruit russet by the more effective sprays is the more undesirable alternative.

Five years' spraying tests for the control of cherry leaf-spot, R. W. GOSS (*Nebr. State Bd. Agr. Ann. Rpt., 1934, pp. 483–494, fig. 1*).—This is a summary of 5 years' work on the control of *Coccomyces hiemalis* infections on sour cherry (*Prunus cerasus*) conducted by the Nebraska Experiment Station. A graphic chart shows the rainfall and the percentage of leaf infection throughout the growing season for each of the 5 yr. in the sprayed and unsprayed blocks. The application of at least four sprays was found to be advisable in the average year, the first, or petal-fall spray, being the most important. Lime-sulfur 1–40 was used in most of the work. None of the other materials used in a few comparative tests proved definitely superior. In one year some injury resulted from the use of bordeaux mixture. Removal of root sprouts or spraying them helped to control early-season spread of infection.

No correlation was found between leaf fall and the number of infections per leaf.

Cherry mottle leaf, S. M. ZELLER (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 92–95, figs. 3*).—This note from the Oregon Experiment Station brings to the attention of pathologists a mottled-leaf condition of cherry trees, first seen by the author in 1920, which has persisted and was reported as rather serious locally in 1934. The affected trees show considerable stunting and a characteristic mottling and wrinkling of the leaves suggestive of a virus etiology. In advanced stages there is also considerable rosetting. The fruit on affected trees is small, hard, sparingly set, and uneven or greatly delayed in ripening.

Control of cherry yellow-leaf on nursery stock, G. L. MCNEW and D. E. BLISS (*Iowa Sta. Bul. 332 (1935), pp. 153–184, figs. 13*).—This investigation on the control of cherry yellow leaf (*Coccomyces hiemalis*) in nursery stock dealt

largely with spraying and dusting practices, and especially in relation to the application time and effectiveness of various fungicides (copper sprays and aluminum and zinc substitutes, sulfur sprays and dusts, and copper dusts). Formulas for both the home-made and proprietary fungicides used are given. Since the contents of commercial mixtures may vary, the analyses of such materials should be checked against these formulas before the application of the data here given.

The outstanding fact brought out was that bordeaux mixture is the most reliable and effective of the fungicides tested. With all fungicides used which were not seriously injurious, sprayed trees grew better than unsprayed ones, even in spite of some fungicidal retardation of growth, since defoliation by the fungus was thus prevented. Kolodust proved satisfactory during one season and retarded growth less than did bordeaux mixture, and while it failed during a period of heavy rainfall it was the most desirable dust used in these trials.

The results with bordeaux mixture during the first growing season were improved by such spreaders as casein, fluxit fixator, rosin-fish oil soap, or oil emulsion, but the differences were less pronounced by the end of the following season.

It was shown that trees ordinarily should be sprayed about once every 10 days, depending on weather conditions, from the time they are from 6 to 12 in. high until near the end of the growing season.

In general, sprays appeared to be more effective than dusts, since they are less easily removed by rain. The practical use of dusts seems to be confined to seasons of light infection.

Spore dispersal from old leaves in early spring and from infected leaves on the trees in summer occurred during rains. To be fully effective the entire leaf area must be covered with an efficient fungicide before spore dispersals occur.

The nature of inhibition between certain fungi parasitic on citrus, J. Guiscafré Arrillaga (*Phytopathology, 25 (1935), No. 8, pp. 763–775, figs. 2*).—In a study conducted at the Pennsylvania State College, 12 species of fungi, mostly parasitic on citrus fruits, were grown in 78 combinations on different culture media. Three types of associations were observed in addition to the five already reported by Porter (E. S. R., 55, p. 543).

Of all combinations, the most interesting were those of *Diaporthe citri* grown in association with either *Phytophthora parasitica* or *P. citrophthora*. In both cases the presence of *D. citri* caused abnormal branching and production of reproductive bodies, such as sporangia, chlamydospores, and oogoniumlike structures. The latter are reported for the first time in *P. citrophthora*. For studying in more detail the nature of the inhibitory factor developed by *D. citri*, the combinations were grown on solid and liquid media differing in composition, and the metabolic products of *D. citri* were tested against both species of *Phytophthora* after their subjection to different conditions. The results appear to indicate that a chemical substance contained in the metabolic products of *D. citri* is the actual cause of the inhibition. This substance is diffusible, filtrable, relatively thermostable, of greater activity in higher concentrations, and constantly produced on a variety of substrates both in the presence and in the absence of *Phytophthora* spp. It can scarcely be an enzyme, since it was not destroyed at a temperature of 110° C.—(*Courtesy Biol. Abs.*).

Corm treatments for the control of scab, P. E. Tilford (*Gladiolus Rev., 11 (1934), No. 1, pp. 8, 9, 18*).—This contribution from the Ohio Experiment Station reports the results of 4 yr. of experimentation with different materials for the control of scab [*Bacterium marginatum*] of gladiolus. Calomel sus-

pensions proved to be outstanding from the standpoint of control, they are applied with greater facility than corrosive sublimate, their strength does not decrease with use, and they can be used in metal as well as in other containers. Treatment with 1 oz. to 1 gal. of water gave very satisfactory control.

Scab of violet caused by Sphaceloma, L. M. MASSEY and A. E. JENKINS (*[New York] Cornell Sta. Mem. 176 (1935), pp. 9, pls. 4*).—The results are presented of an investigation of violet scab, particularly as affecting the sweet violet (*Viola odorata*), known to growers since 1925 but until 1932, when this study was initiated, apparently unknown to most pathologists. The disease is now known to occur in several States of the eastern and southeastern United States and in New South Wales, Australia. The horticultural varieties of sweet violet and the cultivated and wild species of *Viola* known to be affected are enumerated.

The symptoms of the disease and the morphological and cultural characters and temperature relations of the causal fungus (*S. violae* n. sp.) are given. The pathogenicity of the fungus on *Viola* was proved by inoculations on the Princess Mary variety of sweet violet, on the pansy, and on two wild species. Notes on control are included.

Studies on the control of walnut blight in Oregon.—Fifth report of progress, P. W. MILLER (*Oreg. State Hort. Soc. Ann. Rpt., 26 (1934), pp. 105–118*).—In continuation of previously published studies (E. S. R., 71, p. 805) carried out by the U. S. D. A. Bureau of Plant Industry in cooperation with the Oregon Experiment Station, this report presents the outstanding results secured during 1934 and outlines a spray program based on 5 yr. of experimentation.

The results appear to justify the conclusion that proper spraying with bordeaux mixture will reduce the incidence of infection by *Bacterium juglandis* on the nuts to negligible proportions, provided that a sufficient number of well-timed treatments are given. At least two applications of a 2–2–50 bordeaux mixture appear to be needed under average western Oregon conditions, and these treatments should be made (1) just before the bulk of the female flowers come into full bloom and (2) immediately after they have been pollinated. The first treatment should not be made too early in the preblossom stage, and, in general, the shorter the interval between its application and full bloom the more effective will be the protection afforded, since the blooming season is a very critical period in the epidemiology of walnut blight. A quick-breaking summer oil emulsion or a light, medium spray oil at the rate of 1 gal. of oil to 100 gal. of bordeaux mixture, added in the first application, reduced the foliage injury. If the interval between the first and second treatments is much longer than 2 weeks poor results may follow, especially if a prolonged rainy period occurs at the end of pollination and before the second treatment can be applied. It is, therefore, very important that this second treatment be applied when it is reasonably certain that the majority of the female flowers have been pollinated. Under exceptionally rainy conditions a third treatment, applied about 10 days after the second, may be necessary to hold the blight in check. The extreme importance of a proper timing of the treatments is strongly emphasized.

In seedling orchards the degree of control by bordeaux mixture apparently depends to a large extent on the application of the sprays promptly to individual trees when they have reached the proper stages of development.

Dusts did not prove as effective as bordeaux mixture, but a limited reduction in the incidence of infection apparently resulted from four applications, respectively, of a copper-lime dust and a form of flotation sulfur containing about 12 percent of iron oxide and some iron sulfide.

No detectable foliage injury resulted from the use of designated strengths of copper carbonate, basic copper sulfate, ammoniacal copper carbonate, copper phosphate, and a copper silicate preparation. However, none of these copper preparations were as effective in the control of blight as was bordeaux mixture.

Development and cytology of the uredo and teleutosorus in Coleosporium tussilaginis, D. ASHWORTH (*Cellule, 43 (1934), pp. 187–200, pl. 1, figs. 2*).—This paper reports a detailed study of the life history and cytology of *C. tussilaginis*, which parasitizes *Pinus sylvestris* and has its alternate stage on *Tussilago farfara*. It is one of the most common and widely distributed of the British rusts. The development of the uredosorus and teliosorus is described and illustrated, and cytological details are given of the behavior of the nuclei in conjugate division, fusion in the teliospore, reduction division, and the division of the sporidium. The haploid number of chromosomes was found to lie between 8 and 10.

Cultural races and the production of variants in Pestalozzia funerea, C. CHRISTENSEN (*Bul. Torrey Bot. Club, 59 (1932), No. 9, pp. 525–544, figs. 6; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 33*).—"Fifteen cultural races of *P. funerea* were obtained by isolating 150 individual conidia from acervuli borne on the needles of longleaf pine (*Pinus palustris*). These races were distinguished from each other by the following cultural characters: Rate of growth; amount of surface and aerial mycelium; color, topography, and zonation of the colonies; abundance, distribution, and size of acervuli, and time required for their production. In addition, the spores of the different races differed in size, color, shape, and in length and number of setae.

"Ten variants, differing from their parents and each other in the characters listed above, arose in the form of sectors in cultures of the races isolated from pine needles. Races conforming to the description of *Monochaetia* were obtained from conidia isolated from pine needles, and arose also as variants in monoconidial cultures of *P*[*estalozzia*] *funerea* which normally produced spores bearing 3 to 5 setae.

"Seven species of conifers were inoculated with spores of the different races, but none were parasitic under the conditions of the experiment."

Fungi causing stain in logs and lumber in the Southern States, including five new species, R. W. DAVIDSON (*Jour. Agr. Res.* [*U. S.*], *50 (1935), No. 10, pp. 789–807, figs. 4*).—In this study, made in several localities of the southern United States, samples of freshly sawed unstained boards were placed in the lumberyard, and at frequent intervals over a 8 weeks' period attempts were made to isolate fungi from their interior. Staining fungi were found to enter during the first few days. A study of the fungi present in stained logs was also made.

Species of Ceratostomataceae proved responsible for most of the initial blue stain in pine and hardwood lumber and logs. *Ceratostomella ips* and *C. pilifera* were most frequently isolated from recently stained pine logs and lumber, and *Endoconidiophora coerulescens*, *E. moniliformis* n. comb., and *C. pluriannulata* from stained hardwood logs and lumber. Two new species of *Ceratostomella* were obtained from pine, viz, *C. multiannulata*, the most common species found fruiting on lumber but appearing to cause but little discoloration in the interior, and *C. obscura*, obtained only twice from stained pine logs. The genus *Endoconidiophora* was retained for species of *Ceratostomella* having endoconidia. The other new combinations are *E. fimbriata* (*C. fimbriata*), from lumber; *E. adiposa* (*C. adiposum*), from moldy basket veneer; and *E. paradoxa* (*C. paradoxa*), from Chinese *Eleocharis tuberosa*.

A number of Fungi Imperfecti were also obtained from stained lumber, but *Diplodia natalensis* and *Graphium rigidum* were the only ones of this group

which seemed to be of considerable importance. Three Fungi Imperfecti, *Cadophora brunnescens*, *C. repens*, and *Leptographium microsporum*, obtained from stained wood, are described as new species. They seem to be of little importance as wood-staining species.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The struggle for existence, G. F. GAUSE (*Baltimore: Williams & Wilkins Co., 1934, pp. IX+163, figs. 41*).—The several chapters of this work, following a discussion of the problem (pp. 1-11), take up the struggle for existence in natural conditions (pp. 12-26), the struggle for existence from the point of view of the mathematicians (pp. 27-58), the mechanism of competition in yeast cells (pp. 59-89), competition for common food in Protozoa (pp. 90-113), and the destruction of one species by another (pp. 114-140). Two appendixes and a bibliography of 138 titles are included.

The saving of vanishing data, R. T. KING (*Canad. Field Nat., 46 (1932), No. 5, pp. 108-111: abs. in Minnesota Sta. [Bien.] Rpt. 1933-34, p. 81*).—Attention is called to the importance of recording information on the past abundance, scarcity, and distribution of wild animals, especially those species now restricted in their range, forced into new territory, or extinct, and particularly fluctuating species. The various sources of this type of information are mentioned and their worth evaluated.

[Report of research work with ruffed grouse and other game animals], L. OSBORNE (*N. Y. State Conserv. Dept. Ann. Rpt., 23 (1933), pp. 255-295, figs. 6*).—Work with ruffed grouse, including their biology, enemies, diseases, parasites, artificial propagation, feeding practices, etc.; deer; pathological examination of game; game management; etc., is reported upon.

Emulsions of sulfurized oil for rodent repellent, R. B. HARVEY (*Minn. Hort., 60 (1932), No. 9, p. 199; abs. in Minnesota Sta. [Bien.] Rpt. 1933-34, p. 84*).—A discussion of the preparation of water emulsions of sulfurized linseed oil and their application for rodent repellents on nursery trees.

Familiar birds of the Pacific Southwest, F. V. DICKEY (*Stanford Univ., Calif.: Univ. Press; London: Oxford Univ. Press, 1935, pp. LVIII+241, figs. [104]*).—Included in this handbook is a size and color key to the land and water birds commonly met with in California, an illustrated key to the topography of a bird with terms used in descriptions, and an illustrated key to types of beaks. Descriptions of these fowl, many of which are illustrated in colors, make up the body of the work (pp. 3-228). A check list and a subject index are included.

The hawks of North America: Their field identification and feeding habits, J. B. MAY (*New York: Natl. Assoc. Audubon Socs., 1935, pp. XXXII+140, pls. 41, figs. 33*).—In this work on the North American Falconiformes, including the eagles, falcons, hawks, and their allies, and illustrated by 37 colored plates prepared by A. Brooks, a large part of the present knowledge concerning them is brought together in brief form. A foreword by T. G. Pearson, an outline of the classification of the diurnal birds of prey, and appendixes giving the State laws relating to hawks and a reference bibliography are included.

The endogenous development of the coccidia of the ferret, and the histopathological reaction of the infected intestinal villi, C. A. HOARE (*Ann. Trop. Med. and Parasitol., 29 (1935), No. 2, pp. 111-122, pl. 1, figs. 3*).—The author presents a description of the endogenous stages of development of the two species of *Eimeria* parasitic in the ferret *Mustela* (*Putorius*) *putorius*

furo, and of their effect upon the host. "Both coccidia develop exclusively within the epithelial cells of the intestinal mucosa. *E. furonis* invades the small intestine and rectum, while *E. ictidea* is found in the small intestine, being localized in the summit of the villi. *E. furonis* has no special effect upon the host tissues, while *E. ictidea* calls forth a peculiar histopathological reaction, viz, the formation of a deep constriction separating the infected summit of the villus from its basal portion."

Reservoirs of Echinococcus in Minnesota, W. A. RILEY (*Minn. Med.*, *16* (*1933*), *pp. 744, 745; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 69*).—Station studies having shown a high incidence of the larval hydatid tapeworm *E. granulosus* in moose from northern Minnesota, it was suspected that timber wolves constituted the natural reservoir of the adult parasite, and an examination of 3 wolves resulted in the finding of 2 to be parasitized. Attention is called by the author to the danger of human infections from contaminated wild berries and similar sources.

Limnology, P. S. WELCH (*New York and London: McGraw-Hill Book Co.*, *1935*, *pp. XIV+471, figs. 46*).—This is a compact, comprehensive, modern treatise in that field of science which deals with the various bodies and systems of inland or fresh waters. The discussion is focused especially upon the biological productivity of such waters and with all of the causal influences which determine it.

In the first section of the book, the history and present status of limnology are outlined, fresh-water environments are described and classified, and lakes, their origin and diversity, are discussed. The second section deals with the nature of fresh-water environments, including the physical conditions and related phenomena and the chemical conditions and related phenomena. The third and largest section considers biological relations, with chapters on the influence of physical conditions; the influence of chemical conditions; organisms found in inland waters; plankton; bacteria, other fungi, and the nonplankton algae; higher aquatic plants and their limnological significance; nekton; benthos; and biological productivity. Part 4 discusses some special types of lentic environments, including ponds and bog lakes, while the fifth and last division deals with lotic environments or running waters in general. There is an extensive classified bibliography.

The book should be of value to students and workers interested in the conservation and most effective utilization of our fresh-water resources and particularly to those investigating the problems of fish culture and propagation.

Common names of insects approved by the American Association of Economic Entomologists (*Jour. Econ. Ent.*, *28* (*1935*), *No. 4, pp. 726, 727*):—A list is given of 13 additional common names and 1 change (citrus thrips for the orange thrips) adopted by the American Association of Economic Entomologists (E. S. R., 70, p. 499).

Descriptions plus types vs. descriptions alone, C. E. MICKEL (*Psyche*, *37* (*1930*), *No. 2, pp. 118–131; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 79*).—An extended discussion of the importance of type material, in the course of which it is pointed out that some method should be devised by which type specimens would be more accessible to taxonomic workers than they are at present.

Contributions to taxonomy of insects, C. E. MICKEL (*Ann. Ent. Soc. Amer.*, *23* (*1930*), *No. 3, pp. 507–512; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 78*).—A discussion of the subject contributed to a symposium.

The future of taxonomy, C. E. MICKEL (*Science*, *71* (*1930*), *No. 1843, pp. 436–438; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 80*).—Data are presented to show that interest in taxonomy is on the increase.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 727–730*).—The notes here contributed (E. S. R., 73, p. 604) are as follows: *Hyperplatys aspersus* Say Attacking Peach, by D. M. Daniel (p. 727), contributed from the New York State Experiment Station; Phenothiazine, a Promising New Insecticide, by L. E. Smith, F. Munger, and E. H. Siegler (pp. 727, 728); Aluminum Sulfate as a Sticker for Hydrated Lime in Sprays, by J. W. Lipp and M. R. Osburn (p. 728); Effect of Paraffin Wax Emulsions on the Oil-Depositing Properties and Insecticidal Efficiency of Oil Sprays, by W. Ebeling (pp. 728, 729), contributed from the California Citrus Experiment Station; and Economic Injury to Beans from the Activities of the Mason Bee *Osmia pellax* Sandhouse, by R. A. Fulton and H. G. Bergen (pp. 729, 730).

[Report of work in economic entomology by the Kentucky Station] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 10, 11, 29–33, 35, 54*).—The work of the year (E. S. R., 72, p. 74), briefly reported upon, includes control of wireworm injury to tobacco plants, the occurrence and control of the sod webworm, poisoning of white grubs, combinations for effective insecticides, a new spreader for nicotine, spray studies, new carriers and diluents for nicotine, thrips injury to nursery stock, and dormant spray for the rosy apple aphid.

Second report on an investigation into the biological control of West Indian insect pests, J. G. Myers (*Bul. Ent. Res., 26 (1935), No. 2, pp. 181–252, pl. 1*).—The author reports further (E. S. R., 66, p. 849) upon field investigations conducted from September 1930 to the end of March 1934. Following a brief introduction and acknowledgments, part 2 is devoted to general considerations on biological control (pp. 183–188); part 3 considers the itinerary and traveling conditions (pp. 188, 189); part 4 ecological conditions in the regions visited (pp. 189–219); part 5 observations on particular insect pests (pp. 219–246); and part 6 parasites for the West Indies from the Old World Tropics (p. 246). Part 7 presents a summary of results and recommendations (pp. 246–248).

During the period covered 19 major pests were studied, with special reference to their natural enemies and other limiting factors, the pests of sugarcane receiving by far the most attention. A 5-page list of references to the literature is included.

An entomological investigation in Grenada, J. G. Myers (*Trop. Agr. [Trinidad], 12 (1935), No. 8, pp. 216–220*).—In this report of an investigation made during a brief inspection on the island of Granada particular attention is paid to the banana root borer, with notes on sugarcane moth borers (*Diatraea* spp.), their infestation, distribution, wild host plants, and natural enemies, and cacao pests.

Entomological notes, V. H. W. Dowson (*Trop. Agr. [Trinidad], 12 (1935), No. 8, p. 225*).—A list is given of date scale insects, a short note on their occurrence in Basra, and a note on the resistance of the fig moth to cold.

Further notes on the food-plants of Nigerian insects, [II], III, F. D. Golding (*Bul. Ent. Res., 22 (1931), No. 2, pp. 221–223; 26 (1935), No. 2, pp. 263–265*).—Part 2 of this contribution (E. S. R., 58, p. 662) contains additional data obtained from 1925 to 1931 (pp. 221–223), and part 3 data obtained since 1931 (pp. 263–265). The information is systematically presented in table form, with the food plants, part attacked, month of appearance, and locality, with remarks.

Annual report by the Government entomologist, 1933, H. W. Simmonds (*Fiji Dept. Agr. Ann. Bul., 1933, pp. 24–26*).—Brief mention is made of the occurrence of and work with insect pests, particularly the scab moth *Nacoleia octasema* as an enemy of bananas, the introduction of its parasite (*Cremastus*

sp.) from Java, and the egg parasites (*Trichogrammatoidea nana* Zehnt. and *Trichogramma australicum* Gir.); the leaf mining beetle *Promecotheca reichei* of coconuts; damage to French beans by *Ziszera labradus mangoensis* Butl.; occasional injury to strawberries, cabbages, and seedlings by *Prodenia litura*; control of *Aspidiotus destructor* on avocados by the Trinidad lady beetle (*Cryptognatha nodiceps*); housefly control; and weed control by insects.

The resistance of leaves of some pubescent red clovers to puncturing, H. H. JEWETT (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 697, 698*).—Further tests made of strains of hairy or pubescent clovers at the Kentucky Experiment Station (E. S. R., 70, p. 504), using Kentucky 101, Wisconsin 4, Oregon 6, and Oregon 8, are reported.

There was found to be a true difference in favor of the Kentucky clover, the average Kentucky leaf being more difficult to puncture than the average Wisconsin 4, Oregon 6, and Oregon 8 leaves.

Possible effect of regulated production on insect damage to corn, J. H. BIGGER (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 692–695*).—The author concludes that "a regulated cropping system which will decrease the percent of corn and increase the percent of legumes in the rotation will result in a high relative freedom from the attack of many important insects attacking the root and young plantlet of corn."

Insects observed attacking Crotalaria in Louisiana in 1932 and 1933, W. A. DOUGLAS (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 686, 687, fig. 1*).—Brief notes are presented on three species of insects observed to attack *Crotalaria* which are of considerable importance to soybeans in Louisiana, namely, the southern green stinkbug, the beautiful tiger moth *Utetheisa bella* L., and the striped blister beetle *Epicauta lemniscata* Fab.

The cost of controlling apple insects and diseases, with special reference to the codling moth, M. S. TROTH and G. E. MARSHALL (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 698–701*).—This contribution from the Indiana Experiment Station presents figures and a discussion based upon the operation of a 200-acre apple orchard in southern Indiana over a period of 8 yrs. (1926–33), which had an average annual production of 57,000 bu. The total costs per bushel were 77.75 ct., of which 39.60 ct. was chargeable to insect and disease control, with 33.47 ct. chargeable to the codling moth.

***Histological researches into the action of insecticides on the intestinal* tube of insects,** M. PILAT (*Bul. Ent. Res., 26 (1935), No. 2, pp. 165–180, pls. 4*).—The author has found that "(1) the final effect of the usually employed insecticides shows itself in the disintegration and destruction of the epithelium of the midintestine; (2) this destruction is preceded by the exfoliation of the epithelium from the subjacent connective membrane; (3) the histological picture of the intestinal epithelium at the first moment of the action of the poison shows certain peculiar features if compounds of fluorine are used; [and] (4) the histological picture of the intestinal tube of the poisoned insect corresponds with the picture of the hemolymph of the same insect."

A new criterion for the comparison of toxicity with respect to concentration and time, W. A. GERSDORFF (*Jour. Agr. Res. [U. S.], 50 (1935), No. 11, pp. 881–891, figs. 2*).—The author's investigations of the toxicity of rotenone and related compounds led to the recommendation that the minimum product of concentration and survival time (*ct*) be a criterion for comparing toxicities because (1) it always falls within that region of the curve in which the relation of concentration and survival time is most nearly rectangularly hyperbolic, (2) it corresponds to an intermediate point between the influence of either tolerance factor, (3) it gives a value at the point of greatest efficiency

with respect to concentration and time, and (4) it is comparatively easy to determine.

The relative toxicity of a number of compounds related to rotenone as determined by the minimum *ct* product agrees well with the apparent relation as shown by the arching portions of their survival-time curves. This agreement is not shown by the other methods considered. These values, referred to that of rotenone for the same group of goldfish, include rotenone hydrochloride 1.8, toxicarol 0.55, deguelin 0.39, isorotenone 0.23, and tephrosin 0.15.

A list is given of 57 references to the literature cited.

The quantitative relationship between the constitution and toxicity of some rotenone derivatives, W. A. Gersdorff (*Jour. Agr. Res.* [U. S.], *50* (*1935*), *No. 11, pp. 893–898, fig. 1*).—Rotenone and seven of its derivatives compared according to toxicity under conditions corresponding to the minimum value of the *ct* product (see above) at 27° C. were found to have the following relative toxicities to goldfish weighing from 2 to 3 g: Dihydrorotenone 1.4, rotenone 1.0, acetyldihydrorotenone 0.81, acetylrotenone 0.55, dihydrorotenolone 0.15, rotenolone 0.097, acetyldihydrorotenolone 0.082, and acetylrotenolone 0.055.

"Insofar as these compounds and this method of comparison are concerned, each change in chemical constitution effects a characteristic change in toxicity independent of the effect of any other change. The dihydro derivatives produced by saturation of the double bond in the side chain with hydrogen have 1.5 times the toxicity of the corresponding unsaturated compounds. The acetates, whether of the enol type or the acetyl derivatives of the hydroxy compounds, have 0.56 the toxicity of the parent compounds. The hydroxy derivatives have 0.10 the toxicity of the parent compounds. The combined effect on toxicity of more than one change in constitution is equal to the product of the individual effects. Thus, the dihydroacetates have 0.83 the toxicity of the parent compounds; the dihydrohydroxy derivatives have 0.15 the toxicity of the parent compounds; the acetylhydroxy derivatives have 0.057 the toxicity of the parent compounds; and acetyldihydrorotenolone, the derivative including all three changes in constitution, has 0.082 the toxicity of rotenone."

Tolerance of cabbage seedlings to insecticide dips for the control of aphids and cabbage worms, H. G. Walker and L. D. Anderson (*Virginia Truck Sta. Bul. 86* (*1935*), *pp. 1203–1210*).—The authors report upon work undertaken with a view to determining the insecticides that can be used safely in dipping cabbage plants for control of the cabbage aphid and the imported cabbage worm. This work was commenced in the fall of 1931, at which time 20 different insecticides were tested.

The results, the details of which are presented in four tables, have shown that if both cabbage worms and aphids are present at transplanting time the best method of control consists in dipping the infested plants in a pyrethrum spray such as Evergreen before they are set in the field. "If a large number of plants are to be treated, a convenient way to dip them is to mix from 1.5 to 2 pt. of Evergreen with about 50 gal. of water in a barrel and submerge the plants in this solution for about 30 sec., or until all parts of the plants have been wetted with the dip. They then should be removed, and all the excess solution should be permitted to drain in such a way that it can be saved.

"The plants should be set in the field as soon as possible after treatment. They should not be dipped and kept for several days, as serious injury might result from such treatment. If only a small quantity of material is needed, it can be made by mixing 4 teaspoonfuls of Evergreen with each gallon of water used.

"If only aphids are present, they may be controlled with a mixture containing about two-thirds of a pint of nicotine sulfate or Black Leaf 40 in 50 gal. of

water. The addition of 1 qt. of a nearly neutral insecticide soap will increase the wetting properties of this dip and insure a more even coverage of the plants. . . . The infested plants should then be dipped in this solution and handled in the same manner as described for the treatment with the pyrethrum or with the Evergreen solution."

Further studies on devil's shoe-string, Cracca virginiana Linn., V. A. Little (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 707–710, figs. 2*).—The author reports further (E. S. R., 65, p. 846) upon *C. virginiana*, a rotenone-containing plant, a survey of which has been made in the Southwest. The ecology of the plant was studied, samples were collected, and preliminary tests were conducted to ascertain the regions yielding the most toxic material. In addition, samples from other parts of the United States were examined.

"The plant grows in any well-drained soil. The most toxic samples are found in sandy soils, but not all plants growing in sand possess toxic qualities; in fact, most are worthless."

Homologs of paris green.—I, Lower members of acetic acid series, F. E. Dearborn (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 710–714*).—The homologs of paris green; preparation of the greens; methods and results of analysis, the details of which are given in tabular form; and toxicity are considered.

Recent usage of the term "pyrethrin", H. H. Shepard (*Jour. Amer. Pharm. Assoc., 22 (1933), No. 5, pp. 479, 480; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 58*).—This contribution has been noted from another source (E. S. R., 70, p. 205).

A laboratory spray apparatus, E. H. Siegler and F. Munger (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 704–706, figs. 3*).—A home-made laboratory sprayer used in connection with the apple-plug method of testing insecticides against newly hatched codling moth larvae, which has also been employed in spraying foliage in tests against other insects, is described and illustrated.

The black widow spider, W. B. Herms, S. F. Bailey, and B. McIvor (*California Sta. Bul. 591 (1935), pp. 30, figs. 15*).—This summary of information on the black widow or hourglass spider (*Latrodectus mactans* (Fab.)) deals with its distribution, natural habitat, description of the adult, preying habits of the adult, mating habits, proportion of sexes, life history, morphology of the immature stages, longevity, venom apparatus, nature of the venom, laboratory experiments, effect of the bite on man, clinical case records, treatment, and control. A list of 24 references to the literature is included.

On the name of the "blue oat mite" of Australia, H. Womersley (*Bul. Ent. Res., 26 (1935), No. 2, p. 163*).—The author finds that the mite described by W. W. Froggatt as attacking oats in New South Wales in 1921[3] under the name *Notophallus bicolor* n. sp., and also found in Capetown, Union of South Africa, is the same as the European form *Penthaleus major* (Dugès 1834).

National control of the migratory grasshopper in Argentina (*Lucha nacional contra la langosta. Buenos Aires: Min. Agr. Nac., 1934, pp. 134, pls. 8, figs. 70; rev. in Rev. Appl. Ent., 23 (1935), Ser. A, No. 2, pp. 74, 75*).—Papers contributed at special meetings of the Argentine Entomological Society, held in December 1933 and January 1934 to discuss the grasshopper (*Schistocerca paranense*) problem, are presented. Following an introduction by F. Lahille (pp. 13–25), the organization of grasshopper investigational work in the world is considered by J. Liebermann (pp. 27–40). The first part (pp. 41–60) includes accounts of biological control work by E. E. Blanchard (pp. 41–44), of the fungus parasite *Sporotrichum paranense* in Argentina by J. B. Marchionatto (pp. 45–53), and the utilization of *Coccobacillus acridiorum* in grasshopper

[3] Agr. Gaz. N. S. Wales, 32 (1921), No. 1, pp. 33, 34, pl. 1.

control by S. S. Quiroga (pp. 55–60). In the second part (pp. 61–90) the biology of grasshoppers and their winter refuges are considered by C. A. Lizer y Trelles (pp. 61–90). Reports of the Grasshopper Exploratory Commissions Nos. 1, 2, 3, 4, and 7 for the period ended in 1933 are dealt with in part 3 (pp. 91–184).

Locusts and a rational anti-locust policy, B. P. Uvarov (*Empire Cotton Growing Rev., 12 (1935), No. 3, pp. 193–198*).—A general discussion of the subject.

Life history and control of the gladiolus thrips in California, H. L. McKenzie (*California Sta. Circ. 337 (1935), pp. 16, figs. 5*).—The gladiolus thrips, now generally distributed throughout the United States and which occurs in Australia, Africa, Canada, the Hawaiian Islands, and New Zealand, has caused considerable damage to gladiolus plantings in Ventura, Los Angeles, Orange, and San Diego Counties, Calif., since it first appeared in that State in 1932. While its host range is relatively large, it is primarily a pest of gladiolus. All parts of the gladiolus plant are subject to the attacks of this insect except the cormel or bulblet, which is protected by a capsule-like covering.

"The life stages of this insect consist of the egg, first and second larval stages, prepupa, pupa, and adult. The length of the life cycle (from egg to adult) of this thrips in June 1934 at Encinitas, Calif., required a minimum of 14 days, a maximum of 19 days, and 16.5 days on an average. The females of the gladiolus thrips are able to reproduce parthenogenetically, the resulting progeny being males. This thrips overwinters between crops on volunteer gladiolus plants in California. Dispersal experiments indicate that the gladiolus thrips are capable of flying 15 ft. in the air. The wind is probably an aiding factor.

"The predacious sucking insect *Orius* (*Triphleps*) *tristicolor* (White) and the parasite *Thripoctenus russelli* Cwfd. are found attacking the gladiolus thrips in California. Thorough treatment of the corms with any one of the following preparations will insure clean corms: Naphthalene flakes, calcium cyanide, corrosive sublimate (mercuric chloride), or hot water. In addition to the treatment of corms, the most effective field control is a spray consisting of manganese arsenate, brown sugar, and water, or paris green, brown sugar, and water."

The gladiolus thrips, A. G. Ruggles (*Minn. Hort., 61 (1933), No. 5, pp. 97, 98; abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, p. 86*).—A practical contribution.

Ecological studies of the greenhouse thrips (Heliothrips haemorrhoidalis) in Palestine, E. Rivnay (*Bul. Ent. Res., 26 (1935), No. 2, pp. 267–278, figs. 7*).—In studies of the greenhouse thrips the effects of humidity upon the rate of development of the egg, larva, and pupa were found to be quite negligible. "The rate of development and reproduction primarily depends upon the temperature. The larva and adult are more resistant to the ill effects of combined temperature and relative humidity than are the egg and pupa. Humidity of above 87 percent is the safe zone for the development of the pupa. A temperature-activity scale for *Heliothrips* is given. The plant tissue wherein the egg is laid may have a detrimental effect upon the egg under certain conditions. The effects of the particular climatic conditions of Palestine on the seasonal abundance of the insect are described."

Field studies of Thrips tabaci Lind., with especial reference to resistance in onions, H. A. Jones, S. F. Bailey, and S. L. Emsweller (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 678–680*).—This contribution from the California

Experiment Station is based upon work with the onion thrips, a report of which has been noted (E. S. R., 71, p. 669).

Two Hemiptera for use as experimental insects in insecticide studies, W. A. SIMANTON and F. ANDRE (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 695, 696*).—*Lygaeus kalmii* Stål and *Oncopeltus fasciatus* (Dallas), both members of the family Lygaeidae, have been reared successfully in large numbers throughout the year by the authors in the laboratory and under greenhouse conditions.

Life history and migration of the apple woolly aphid, W. J. SCHOENE and G. W. UNDERHILL (*Virginia Sta. Tech. Bul. 57 (1935), pp. 31, figs. 15*).—The results of studies of the migrations, development, and the proximity of elms as influencing the infestation of and the injury to the roots of nursery trees by the woolly apple aphid conducted near Richmond during a period of 15 seasons are summarized. The details are given in 14 tables.

In this country with the American elm present migration regularly takes place each spring and each fall, the winged forms migrating from the apple to the elm in the fall and from the elm to the apple in the spring. Apterous forms commonly occur all the year round on apple. In Europe and Asia, where the American elm does not occur, the insect continues to live without sexual revival. It is pointed out that in addition to the migrants as observed by Patch (E. S. R., 28, p. 251), there occur in Europe, Asia, and North America summer migrants which give birth to long-beaked viviparous forms as well as the true sexes. These summer alates appear only in small numbers, but they are of considerable importance in the natural spread of the insect over long distances by flight.

"It has been found in this study that the new-born nymphs are very important in the spread of the pest in the nursery. In this stage the insects may continue to wander for a few days before settling down to feed. By placing sticks and traps of various kinds about infested plants, some information was gained regarding the time, the direction, and the rate of the spread.

"The number of rosettes on elms is directly influenced by the nearness of apple trees. If no apple trees are present in the immediate vicinity, there will be very few rosettes. On the other hand, if nursery stock is planted adjacent to elm trees there may be hundreds of rosettes on a single elm tree. The degree of infestation of newly planted apple trees is likewise influenced by the proximity of infested elms. At Waynesboro, Va., where no elms were present within a mile, the aerial infestation of apple seedlings the first summer was practically negligible, whereas at Richmond, where the elms were present in abundance, an average of about 80 percent of the seedlings were infested.

"The apterous forms on apple matured in about 14 to 16 days when the daily mean temperature averaged around 70° F., and they matured in about 11 days with the daily mean around 80°. The progeny was born at the rate of about 5 per day over a recorded period averaging 17 days. The life of the aphids averaged nearly 30 days.

"The progeny from spring migrants infest the crown and roots of nursery stock early the first season after planted. The percentage of trees infested on the roots the first season at Richmond averaged over 80 percent for 10 seasons. At the end of the second season about 40 percent of the trees were infested with the degree of root knotting much worse than for the first year. On an average, the percent of trees with root infestation did not increase much during the third year."

A list is given of 20 references to the literature.

Four lupine aphids, G. F. KNOWLTON (*Ent. Soc. Wash. Proc., 37 (1935), No. 5, pp. 112–115, figs. 2*).—Contributing from the Utah Experiment Station, the

author gives descriptions of four aphids collected from *Lupinus* as follows: *Aphis lupine-hansoni* n. sp. from Washington State, *Macrosiphum zionensis* n. sp. and *A. lupini* from Utah, and *M. albifrons*.

Studies on aphides infesting the potato crop.—III, Effect of variation in relative humidity on the flight of Myzus persicae Sulz., W. M. DAVIES (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 106–115, figs. 5*).—In continuation of earlier work (E. S. R., 73, p. 210), controlled laboratory experiments on the effect of variation in relative humidity upon the flight of the green peach aphid clearly demonstrate an inhibitive action of high humidities.

On the biology of Dysdercus howardi Ballou (Hem.), E. I. MACGILL (*Bul. Ent. Res., 26 (1935), No. 2, pp. 155–162*).—In studies at Manchester, England, of cotton stainers (*D. howardi*) from Trinidad, it was found that "at 27° C. the life cycle of *D. howardi* occupies approximately 32 days. Copulation (at 27°) takes place approximately 2.8 days after the last molt of the female insect. At 27° oviposition begins about 8 days after the last molt of the female, and 5 to 6 days after mating. The average number of eggs laid by one female is 141.9, and the average number of batches is 2. Mortality appears to be highest among the fifth stage nymphs. The ratio of females to males is 1:1.27. The average length of adult life in the female *D. howardi* is 11 days." A table comparing *D. howardi* with other species of the genus *Dysdercus* is given.

Information on the cotton stainer Dysdercus ruficollis [trans. title], J. WILLE (*Min. Fomento, Dir. Agr. y Ganadería [Peru], Informe No. 28 (1934), pp. 14*).—A practical account of this serious enemy of cotton in Peru.

Phylloxera devastatrix Perg. on pecans, H. BAKER (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 681–685*).—Of the several species of *Phylloxera* known for many years as pests of pecans in Louisiana, Mississippi, and Texas, *P. devastatrix*, here considered, is said to be by far the most important. In Louisiana it has been found to confine its attacks largely to the varieties of Stuart and Schley and, occasionally, to Success. It may attack any part of the current season's growth, including shoots, leaf and leaflet stems, leaves, and nuts. Notes are given on its life history and habits.

A number of contact insecticides, used alone and in combination, have been tested by the author for their efficiency in controlling infestations of this pest when applied late in the dormant period and during the delayed-dormant period, the details for the seasons 1932 and 1933 being given in tables. The results have led to the recommendation that the application of a spray either late in the dormant period or during the delayed-dormant period, according to convenience, using nicotine sulfate 1:800 (1 pt. to 100 gal. of spray) in combination with either potash fish-oil soap at the rate of 4 lb. to 100 gal. of spray or liquid lime-sulfur (testing at least 32° B.) at the rate of 2.5 gal. to 100 gal. of spray, is a means for effecting control on pecans.

"If the phylloxera infestation is light, the thorough application of a spray containing either liquid lime-sulfur at the rate of 2.5 gal. to 100 gal. of spray or nicotine sulfate 1:800 in combination with 0.5 percent lubricating oil emulsion should give a satisfactory degree of control. In those orchards in which it is necessary to spray to control the obscure scale (*Chrysomphalus obscurus* Comst.) as well as phylloxera, a single application, late in the dormant period, of a spray containing nicotine sulfate 1:800 in combination with a 4 or 5 percent lubricating oil emulsion is recommended."

Barium fluosilicate as a control for cabbage worms (Pieris rapae L.), V. R. DIAMOND (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 714, 715*).—In tests conducted at the Indiana Experiment Station barium fluosilicate showed a definite margin of effectiveness against the imported cabbage worm over arsenate of

lead-lime 1:10 in both 1932 and 1933. Careful examination showed that the barium fluosilicate dust killed the cabbage worms more rapidly. In many cases it was noted that the arsenical dust had a repelling effect on the worms, and some of them were able to migrate to some undusted portion of the plant and thus escape the insecticide application.

Relation of hosts to abundance of cotton bollworm, D. Isely (*Arkansas Sta. Bul. 320 (1935), pp. 30, figs. 7*).—The author's studies here reported relate particularly to stages of the bollworm as reared on host plants at Fayetteville, Ark., from 1932 to 1934, inclusive. In his study of the relation of various hosts to its outbreaks, corn was found to be the most favored. "Not only are corn silks most attractive for oviposition by the moths, but larvae develop more rapidly on green corn ears than upon any other host. The moths reared from larvae fed on corn are larger and have a greater fecundity than those reared from any other host. A succession of plantings of corn is favorable to the abundance of the species, since it makes available the most favorable food for the successive generations. Legumes grown in combination with corn may extend the breeding season of the bollworm.

"When reared on green corn ears and at a temperature of 30° C. or above, the bollworm may pass through its immature stages in as short a period as 30 days. Moths reared from worms fed on green corn, and kept at 25°, during their adult lives deposited on an average 1,848 eggs, or more than twice as many as those reared on any other host. Parasitism may be an important check at times on the abundance of the bollworm when it is a leaf feeder."

In addition to the damage it does to cotton bolls and corn ears, the seeds and foliage of the State's more important leguminous crops, tomato fruits, and the heads of grain sorghums are attacked.

Studies of Incurvaria koerneriella Zell. (Lepidoptera, Incurvariidae) [trans. title], A. J. Jensen (*K. Danske Vidensk. Selsk., Biol. Meddel., 10 (1932), No. 5, pp. 49, figs. 32; Ger. abs., pp. 41–49*).—A report of studies of a beech leaf pest occurring in Denmark.

Contribution to the study of intestinal diseases of the silkworm: Two new types of noninfectious dysentery [trans. title], A. Paillot (*Ann. Inst. Pasteur, 54 (1935), No. 5, pp. 627–648, figs. 15*).—Five types of noninfectious dysentery of the silkworm, including two here described for the first time, are now recognized by the author.

A statistical method of determining the efficiency of banding for codling moth, with eight years' results, R. E. Barrett (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 701–704*).—The author presents information based upon approximately 210,000 walnut trees covering a period of 8 yr.

1934 experiments with newly developed types of oils for codling moth control, C. R. Cleveland (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 715–726*).—The study here reported, presented in detail in tabular material, is summarized as follows:

"The new emulsible oils, embodying the principle of chemical treatment to produce distinct modification of the physical properties of the oil, are shown positively in complete 1934 tests to exhibit the following characteristics as compared to former types of oil used in codling moth control: (1) Prolonged surface persistence, superior spreading properties, and improved toxicity; (2) marked superiority in control of worms and stings, both in combination with lead and nicotine, particularly with lead; (3) more even film coverage and less color spotting than paste emulsions; (4) oil-lead residue more easily removed than with pastes; (5) not subject to separation or deterioration in storage and shipment; (6) contain 95 percent oil—no water—nearly or quite 100 percent active insecticidally; (7) not subject to hard or lime water curdling or similar

emulsification difficulties; (8) easier to pour and measure than paste emulsions; (9) equally safe on foliage and fruit; (10) fewer applications and lower concentrations required to produce a given control result.

"No spray schedule [is] yet developed that will give satisfactory control where codling moth is serious and at the same time make washing unnecessary on late apples.

"Oil-lead, followed by oil-nicotine, appears to be safe and more effective than lead alone, but is not equal to oil-lead throughout in worm entrance control. This program, however, gives satisfactory control in most cases, reduces the residue load, and has supplementary value in red spider and leaf hopper control.

"Apparently a total of at least 6 percent oil can be used during the season with lead or with lead and lime without danger of injury. However, it appears to be unsafe to use as much as 6 percent total oil, where any one application consists of 1.5 percent oil or more and where the oil is not combined with lead, lime, or other solids, on susceptible varieties and under unfavorable conditions. Lime may not be required with the new oil-lead sprays to prevent injury, but it is *probably advisable to include lime with any oil-lead combination because* of the proved fact that lime facilitates residue removal.

"The new oils plus nicotine are superior in efficiency to former types of oils combined with nicotine, but their margin of superiority used in this way is not so great apparently as when used with lead."

Studies on a peculiar oscillatory movement of the larva of the ramie moth Arcte coerulea Guenée, T. Yamada (*Mem. Col. Sci., Kyoto Imp. Univ., Ser. B, 9 (1933), No. 1, pp. 1–45, pls. 5, figs. 13*).—This is a report of a study of the larva of *A. coerulea*, in which there occurs a reflex movement referred to by the author as the "oscillatory movement" or the "oscillatory reflex." In this movement the larva swings the anterior one-third of the body from side to side in a short but definite period for a fairly long time.

Studies on the higher Diptera of medical and veterinary importance: A revision of the genera of the family Muscidae Testaceae Robineau-Desvoidy based on a comparative study of the male and female terminalia—the genera Adichosia Surcouf and Auchmeromyia Brauer and Von Bergenstamm sens. lat., W. S. Patton (*Ann. Trop. Med. and Parasitol., 29 (1935), No. 2, pp. 199–230, figs. 21*).—This is in continuation of earlier studies (E. S. R., 73, p. 514).

The occurrence of two species of cecidomyids on meadow foxtail (Alopecurus pratensis L.) hitherto unreported in Canada, H. A. Gilbert (*Canad. Ent., 67 (1935), No. 7, pp. 154–156, fig. 1*).—Notes are presented on the occurrence of *Dasyneura alopecuri* Reut. and *Stenodiplosis geniculati* Reut.

The disposal by burial of fruit infested with larvae of the Mexican fruit fly, C. C. Plummer and W. E. Stone (*U. S. Dept. Agr. Circ. 349 (1935), pp. 16, fig. 1*).—In the experiments conducted in 1931 adults of the Mexican fruit fly emerged from pits 18 and 27 in. deep in an unpacked soil series.

Larvae passed through the soil for considerable distances, in some instances, before pupating, although the greater number, by far, pupated close to the fruit at the bottoms of the pits. "It is suggested that, to prevent the emergence of any flies, infested fruit be covered with at least 4 ft. of soil if the soil is not packed. When packed, burial at a depth of 18 in. should be sufficient. In dry periods following rains there was a tendency for fissures to open at the edges of the pits when soil of the adobe type was used in an experiment. Burrowing insects make passages in the soil through which fruit fly adults might escape. Burial pits should be examined occasionally to make sure that no flies are being allowed to escape through fissures that are formed in the soil or by passages made by other insects.

"In the experiment of 1932 no adults emerged from 18 in. of packed wet and dry sand placed above infested fruit. One dead larva was found as high as 11 in. above the fruit. Most of the puparia were in the soil surrounding the fruit; one was 6 in. above the fruit; the rest were within 4 in. above the fruit. One adult was found 9 in. above the level of the fruit, but most of the adults were within the first 4 in. When moistened, the sand becomes so compact and hard that it is inconceivable that flies could pass through it. The data indicate that no flies will emerge from infested fruit if it is covered with 18 in. of well-packed, preferably moistened, sand when it is as fine as that used in this experiment.

"Although mangoes were used in these experiments, it is believed that these results will also hold for citrus fruits."

Insectary studies on the longevity and preoviposition period of the blueberry maggot and on cross breeding with the apple maggot, L. C. McAlister, Jr., and W. H. Anderson (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 675–678*).—Following a description of the feeding method employed, the authors report upon the attraction of the solutions tested, the longevity of adults, the preoviposition period, and interbreeding.

The biology and control of the pepper maggot Zonosemata electa Say, Trypetidae, R. C. Burdette (*New Jersey Stas. Bul. 585 (1935), pp. 31, figs. 34*).—This contribution, which supplements the studies reported by Peterson (E. S. R., 49, p. 356) and the author (E. S. R., 67, pp. 561, 564), reports upon work conducted since 1927 on the life history, habits, distribution through the State, and control of *Z. electa*. Much detailed information is presented in nine tables.

As a result of control work in 1931 and 1932 it is recommended that "talc dust at the rate of 25 to 30 lb. per acre be applied when the young peppers are just forming and continued at weekly intervals until about August 10 in southern New Jersey and about August 20 in middle New Jersey. If rain washes the dust off, it must be replaced at once. The dust can best be applied by means of a continuous action hand duster. The nozzles should be set so that the dust is blown on the undersides of the leaves and thoroughly covers the young peppers. A row of peppers should be left untreated in every 0.5 acre for a trap row. Beginning about August 1, the larger peppers from this trap row must be picked every week and destroyed either by burying or by crushing so as to destroy the developing maggots."

Biology of the midge Chironomus tentans Fabricius, and methods for its propagation, W. O. Sadler (*[New York] Cornell Sta. Mem. 173 (1935), pp. 25, pls. 2, figs. 2*).—A report is made of a study conducted with a view to determining the practicability of propagating midge (*C. tentans*) larvae as a forage crop for young fish that feed mainly on living organisms.

It was found that chironomid larvae can be reared profitably, in conjunction with *Daphnia* and other fish food organisms, in small propagating ponds treated with artificial fertilizer and connected with a natural rearing pond for young fish. "The chironomid production of a natural pond can be greatly increased by treating it, at proper intervals, with a suitable quantity of artificial fertilizer. Soybean meal will give better results than will a combination of sheep manure and superphosphate or sheep manure and soybean meal. *C. tentans* is well adapted to propagation because of high reproductive ability and a comparatively short life cycle with at least four generations in a year."

On the gall midges injurious to the cultivation of willows.—II, The so-called "shot hole" gall midges (Rhabdophaga spp.), H. F. Barnes (*Ann.*

Appl. Biol., 22 (1935), No. 1, pp. 86–105, pls. 4, figs. 3).—This second contribution (E. S. R., 68, p. 70) deals with *R. saliciperda* Dufour, *R. triandraperda* n. sp., *R. purpureaperda* n. sp., and *R. justini* n. sp.

The study has shown that several species of gall midges are responsible for the so-called "shot hole" midge damage to willow stems and branches and that, so far as can be ascertained, each species is restricted to one (in one case three) species of willow. The bionomics of these species of *Rhabdophaga* have been worked out. "It has been found that, while all multiply by means of unisexual families, the first three species are single brooded but that *R. justini* has two broods a year. *R. saliciperda* lives on *Salix caerulea*, *S. fragilis*, and *S. alba* (Cecconi), *R. triandraperda* will only attack *S. triandra*, while *R. purpureaperda* and *R. justini* are restricted to *S. purpurea*. The nature of the damage caused by the larvae of these midges has been described and control measures have been discussed. . . . Keys have been drawn up for the identification of the midges using host plants, larval, pupal, and adult female characters. The following parasites are recorded—Torymidae: *Torymus* sp., near *auratus* Fonsc.; Eurytomidae: *Eurytoma aciculata* Ratz., *E. saliciperdae* Mayr.; Pteromalidae: *Tridymus salicis* Nees; Eulophidae: *Pleurotropis* ? *caenus* Walk., *Tetrastichus flavovarius* Nees, *T. roesellae* De Geer; Platygasteridae: *Platygaster cecidomyiae* Ratz., *P.* sp. (? *philinna* Walk.)."

The culture of mosquito larvae free from living microorganisms, W. Trager (*Amer. Jour. Hyg.*, 22 (1935), No. 1, pp. 18–25).—The author obtained normal development of the larvae of the yellow-fever mosquito in the absence of micro-organisms by the use of a medium consisting of a standard autoclaved protein-free liver extract with autoclaved yeast. Larvae failed to grow when either the liver extract or yeast was omitted.

Researches on the morphology, biology, and control of the ambrosia beetle Xyloterus lineatus Oliv., C. Hadorn (*Recherches sur la morphologie, les stades évolutifs et l'hivernage du bostryche liseré (Xyloterus lineatus Oliv.). Thesis, École Polytech. Féd., Zürich, 1933, pp. 120, pls. 3, figs. 77*).—This report of studies of the ambrosia beetle *X. lineatus* is presented with a list of 53 references to the literature.

Biological notes on Ataenius cognatus (Lec.), a new pest of golf greens in Minnesota (Scarabaeidae—Coleoptera), C. H. Hoffmann (*Jour. Econ. Ent.*, 28 (1935), No. 4, pp. 666, 667).—Notes are contributed from the Minnesota Experiment Station on the life stages and descriptions of the larval and pupal stages of *A. cognatus*, infestation by which was first detected on golf courses in St. Paul in July 1932. This scarabaeid is said to have been recorded from New England, Indiana, Florida, Arizona, and New Mexico, with indications that it also occurs in Ohio, Illinois, Missouri, and Texas.

Control consists in the proper disposal of all grass cuttings and excess fertilizer and the removal of refuse at least twice a week to a distant compost heap.

Bark beetle control in Minnesota, L. W. Orr (*Smoke Screen*, 9 (1933), No. 7, pp. 1–3; abs. in *Minnesota Sta. [Bien.] Rpt. 1933–34*, pp. 58, 59).—It is pointed out that an unusual number of Norway and jack pine trees were killed in Minnesota during the past 3 yr. by bark beetles, especially *Ips grandicollis* and *I. pini*. Drought appears to be an important factor in weakening the trees. Control measures applicable for these insects include the cutting and barking of recently infested trees or the oil burning of the bark of trees that have older broods present. Reference is made to the successful control work conducted in the Bemidji State Park.

The Mexican bean beetle in Mexico, R. J. LANDIS and C. C. PLUMMER (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 12, pp. 989–1001, figs. 5*).—This is a report of a biological study of the Mexican bean beetle undertaken in 1930, presented under the headings of distribution, seasonal activity, climate and extent of bean beetle infestations in the vicinity of México, D. F. (Mexico City), life history, behavior late in the season, and overwintering. The details of its distribution in Mexico were secured through the cooperation of the Mexican Department of Agriculture. Localities in Mexico where the beetle has been recorded, its infestation in various localities in Mexico on different dates in 1930, a summary of daily temperature records at México, D. F., from July 1 to September 30, 1930, and the length of instars and prepupal and larval periods in 1930 are presented in tabular form.

The pest has been found to be widely distributed and destructive to beans in Mexico, it having been recorded from elevations ranging from 3 to 8,845 ft., chiefly within the area delimited by the 20° C. isotherm, which includes most of the central plateau of Mexico. "Precipitation and extremes of temperature within this area vary considerably. The effects of these factors on the development of the bean beetle have been determined only in Mexico City.

"Severe damage caused by this insect was observed at Atlixco, Puebla (6,171 ft.), and at Cuernavaca, Morelos (5,069 ft.). In the vicinity of Mexico City the heaviest infestation was found near the villages of Mixquit and Chalco, but less than half of the plants showed any serious injury.

"Life history studies made near Mexico City under field conditions show the length of time spent in each developmental stage throughout the season and its relation to the temperature. One generation of bean beetles matured in an average of 56.74±0.21 days at a mean temperature of 17.2° and an average relative humidity of 66.6 percent.

"Apparently the destruction of the bean plants by frost has much to do with the disappearance of the adult insects from the fields in the fall. In one instance beetles continued to feed and oviposit 4 mo. beyond the time of their natural occurrence in the field. This was probably due to the favorable temperature and humidity maintained in a protected spot where beans were grown. It is not known where and how the adults pass the dry season in Mexico.

"Optimum conditions for the bean beetle are not found in the Valley of Mexico, if we consider temperature, number of generations, and injury done to beans."

Further experiments on Mexican bean beetle control, N. TURNER and R. B. FRIEND (*Connecticut* [*New Haven*] *Sta. Bul. 371* (*1935*), *pp. 419–452, figs. 3*).—The present contribution (E. S. R., 66, p. 761) summarizes information obtained during 1932, 1933, and 1934 in experiments conducted with a view to determining (1) the effects on control of the Mexican bean beetle of (a) date of planting and (b) distance of spacing plants in the row, and (2) control by means of insecticidal treatments on string, lima, and shell beans.

Weather records show that the summer temperatures in the State are not sufficiently high to cause the death of young larvae.

"Experiments conducted at the station farm at Mount Carmel to learn the relation between the date of planting string beans and bean beetle injury showed that beans growing between May 28 and June 15 were attacked by overwintering adults and first-generation larvae. Plants growing between July 18 and August 15 were attacked by first-generation adults and second-generation larvae. Maximum bean beetle injury occurred when a large number of adults attacked the plants early in the period of plant growth. Yield reduction was largest on beans planted July 1 and 10 and least on beans planted June 1 and 10. Injury to pods

due to bean beetle feeding was most serious between July 18 and August 15 and between September 10 and 30, because during these periods migrating adults commonly fed on bean pods.

"Beans planted during May required two spray applications, about June 7 and June 21. Those planted June 1 and 11 failed to produce profitable increases in yield as a result of spray applications. Plantings made June 21 required one spray treatment, about July 29. July 1 plantings required two sprays, about July 29 and August 9. Later July plantings required two sprays, about August 9 and 28. . . . In general, beans planted at least 4 in. apart in the row produced the most satisfactory crop and decreased the difficulty of bean beetle control.

"Magnesium arsenate applied to bean vines before the adult beetles had deposited their eggs reduced egg deposition considerably. Barium fluosilicate was less effective in reducing egg deposition. Magnesium arsenate sprays and dusts, barium fluosilicate sprays and dusts, copper-lime-calcium arsenate dusts, and derris and pyrethrum dusts controlled bean beetles satisfactorily and produced substantial increases in yield. Derris and pyrethrum dusts were as effective in controlling bean beetles as the other materials and left no undesirable residues on the pods. Bordeaux mixture without the addition of any poisonous material was moderately effective in preventing bean beetle injury to lima beans. Copper-lime-calcium arsenate dust followed by derris dust was slightly more effective. Three applications of spray or dust produced a satisfactory increase in yield of lima beans. One application was made about June 28 and the other two about August 1 and 9.

"Dwarf horticultural beans were badly affected by mosaic and bacterial blight. Use of poisonous dusts about June 26, followed by derris and pyrethrum dusts about August 1, produced a satisfactory increase in yield.

"All arsenical materials used in these experiments occasionally caused foliage injury to bean plants, but this injury was usually not serious. Barium fluosilicate caused no foliage injury in any test applications. Derris and pyrethrum dusts caused no foliage injury."

Analyses of pods for arsenical and fluorine residues showed that their accumulation "depended on the size of pods at the time of the insecticidal treatment rather than on the amount of rainfall between treatment and harvest. Any poisonous material applied after the pods formed left an undesirable residue. All poisonous applications should cease when the blossoms drop from the vines. Derris dust containing at least 0.4 percent rotenone, or pyrethrum dust containing at least 25 percent pyrethrum flowers, should be used after the blossoms fall. These materials leave no residue poisonous to man under normal conditions. They are very satisfactory for earlier applications and may be used throughout the season."

The phosphorus content and requirements of the flour beetle Tribolium confusum Duval, and a study of its need for vitamin D, J. W. Nelson and L. S. Palmer (*Jour. Agr. Res.* [*U. S.*], *50* (*1935*), *No. 10*, *pp. 849–852*).—It was found from analyses of the confused flour beetle at different stages in its life, made at the Minnesota Experiment Station, that "the eggs, larvae, pupae, and adults contain, respectively, 58.8, 42.26, 40.61, and 39.07 percent of dry matter. The dry matter of eggs, larvae, pupae, and adults contains, respectively, 1.85, 2.07, 2.15, and 2.36 percent of ash, and 0.445, 0.455, 0.522, and 0.586 percent of phosphorus. *Tribolium* does not need vitamin D for any physiologic function that can be detected by length of time to pupation or by phosphorus content of the pupae. The time of pupation of *Tribolium* is somewhat proportional to the amount of phosphorus in the ration, other factors being constant. The limiting amount of phosphorus is probably 0.1 percent. However, the percentage of phosphorus in the pupae is constant regardless of the amount of phosphorus in the

ration. The slower development and smaller populations of *Tribolium* in patent flour and similar products than in whole-wheat flour is probably due in part to the low phosphorus content of these foods."

The rôle of predatory agents in the artificial control of the mountain pine beetle, H. J. Rust (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 688–691, fig. 1*).—In the study here reported it was found that if thoroughly protected from all predators a large percentage of prepupal larvae, pupae, and immature adults of the mountain pine beetle will mature in the duff and successfully attack healthy standing trees. "It was also found that few of the exposed immature broods within the duff either on the plats or around freshly peeled infested trees remained undiscovered by predators after 10 days. It is therefore concluded that, on areas where ants, centipedes, and small mammals, such as those mentioned in the paper, are present, the peeling method of control can be conducted with success while the beetles are in the larval and pupal stages. Furthermore, it can be rather safely assumed that in all white pine and lodgepole pine stands a sufficient number of these beneficial species are present to make the peeling method of control successful."

Notes on Anaphes pratensis Först., egg parasite of the Colorado potato beetle [trans. title], A. Couturier (*Rev. Zool. Agr. et Appl., 34 (1935), No. 6, pp. 88–92*).—A discussion of the status of this egg parasite, which has been found in France.

Notes on Apanteles sesamiae Cam., a parasite of the maize stalk-borer Busseola fusca Fuller in South Africa, G. C. Ullyett (*Bul. Ent. Res., 26 (1935), No. 2, pp. 253–262, figs. 6*).—This contribution deals with the only parasite of *B. fusca* that is of importance in the eastern Transvaal, namely, *A. sesamiae*. A description is given of the adult, and the morphology of the last-stage larva of the parasite is discussed at length. The biology and bionomics of the species are dealt with, and the effect of parasitism on the host is described. The extent of natural parasitism and the rapidity of increase in the field show that *A. sesamiae* is an effective parasite of the stalk borer in the Union of South Africa. The results of cold-storage experiments are given and the methods of shipping parasite material are described. It was found impracticable to ship cocoons, but successful consignments of parasitized borer larvae were sent to Canada.

Experimental investigations of the influence of temperature and humidity on the oviposition of the granary weevil [trans. title], P. H. Tsai (*Agr. Sinica, 1 (1934), No. 1, pp. 34, figs. 9; Ger., pp. 1–19, Chin., pp. 20–34*).—This report of studies of the granary weevil is presented with a list of 18 references to the literature.

Some recent additions to our knowledge of the biology of the pea weevil, A. O. Larson, T. A. Brindley, and F. G. Hinman (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 668–670*).—The ability of pea weevils to live and lay viable eggs after the second winter spent in hibernation indicates that the recommendation to hold seed over 1 yr. is not entirely adequate. "The ability of the weevils to lay eggs before hibernating and the long oviposition period when blooms are available may be of great importance where successive crops of early and late peas are produced in the same section during a summer. The fact that they may lay several hundred eggs over a long period of time also has an important bearing on any control method that may be outlined."

The willow weevil as a deciduous fruit insect pest, A. D. Borden (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 661–665, figs. 3*).—The introduction of the willow weevil *Mimetes* (*Stamoderes*) *uniformis* Casey into the fruit districts of Sonoma County, Calif., is pointed to by the author as a striking demonstra-

tion of the possibility of insects occurring on native, economically unimportant plants becoming serious pests. Introduced into deciduous fruit orchards on willow props cut along the banks of the Russian River and first collected from apple orchards by the author in 1927 about 5 miles north of Sebastopol, this weevil has caused severe damage, and in several areas the loss has exceeded 50 percent of the crop. Since 1927 an almost continuous chain of infestations has been found from the nearest point on the river to the west side of Sebastopol, a distance of approximately 8 miles. Although willow is apparently the only native host along the river bank, in the orchard it has been taken on apple, pear, peach, cherry, and prune. Apple is the preferred host of the orchard group, and the Gravenstein variety has shown the heaviest injury.

Observations of its life habits are briefly noted. Due to the inability to fly, the adults have been effectually protected against by the scraping of rough bark from the trunks or scaffold limbs and the application of a 6-in. band of ordinary white shellac covered by tree tanglefoot. That the banding effectively kept the beetles from damaging the fruit was proved by several large checks made from fruit out of the control area. Tests were also made of six different baits applied to destroy the beetles gathered below the bands, of which willow twigs dipped in a paris green solution gave the best results. Poisoned bran mash, ground apple, and dried twigs were found to dry out quickly, with the resulting failure of adults to feed upon them after 3 or 4 days.

Plum curculio and plum gouger, A. G. Ruggles (*Minn. Hort., 61 (1933), No. 8, pp. 154, 155, figs. 2*).—A practical account of the plum curculio and the plum gouger.

A preliminary report on the response of the European corn borer to light, G. E. R. Hervey and C. E. Palm (*Jour. Econ. Ent., 28 (1935), No. 4, pp. 670–675, figs. 3*).—In work at the New York State Experiment Station light traps of the type tested and under the conditions governing the experiment reported appear to have little value in protecting sweet corn from the European corn borer. "Substantial moth catches were made over a period of 42 days and over half of the specimens were females. The infestation developing in the experimental fields, however, was apparently an average infestation for that general area.

"The traps appear to have value as a means of studying the habits of the insect, particularly the period of flight, flight habits, and the effect of weather conditions on the activities of the moths. It is possible that with a different arrangement and number of lights or a different light source the moth population in the field might be lowered sufficiently to reduce the normal larval population. However, the number of moths captured under the conditions of the experiment reported here must have represented only a small part of the moth population of the field."

Observations on the habits of an introduced pine sawfly, Diprion simile Htg., H. A. U. Monro (*Canad. Ent., 67 (1935), No. 7, pp. 137–140, fig. 1*).—This is a preliminary contribution based upon observations of the introduced pine sawfly made in Canada during the season of 1934. This sawfly occurs in the northeastern United States, it having been reported by Britton and Zappe in 1917 (E. S. R., 39, p. 760) and by Middleton in 1923 (E. S. R., 50, p. 458). The species was first observed in Canada at Oakville, Ont., in 1931 and again in a Montreal, Que., nursery in 1933. It was found to attack any species of *Pinus* commonly growing in the Province of Quebec, experiments having shown that *P. montana*, *P. sylvestris*, *P. banksiana*, and *P. strobus* are all readily selected for oviposition, preference being shown for the five-needled *P. strobus*.

Sirex noctilio (Hym.) and its parasite in New Zealand, D. Miller and A. F. Clark (*Bul. Ent. Res., 26 (1935), No. 2, pp. 149–154, pl. 1*).—This contri-

bution relates to plantations of exotic conifers in New Zealand, now amounting to some 500,000 acres, in which *S. noctilio*, though not a serious pest of healthy trees, has attracted considerable attention owing to its establishment throughout the Dominion. This species, the steel-blue borntail borer or wood wasp of Europe, in New Zealand attacks *Pinus radiata*, *P. ponderosa*, *P. laricio*, *P. muricata*, *P. austriaca*, *P. pinaster*, and *Larix europaea*, and on one occasion was found attempting to oviposit in the native miro (*Podocarpus ferrugineus*). Attacking suppressed, dying, and dead trees for the most part, this insect is nevertheless an important factor detrimental to forest protection, since it may hasten the death of trees that could be utilized, as well as creating conditions favorable to the breeding of the European bark beetle *Hylastes ater* Payk., now well established in many regions.

Biological studies of certain species of Caliroa Costa and Endelomyia Ashmead (Hymenoptera, Symphyta), H. W. Miles (*Ann. Appl. Biol.*, *22* (*1935*), *No. 1*, *pp. 116–133*, *pls. 2*, *figs. 3*).—The author's studies reported relate to larvae of the genera *Caliroa* and *Endelomyia*, well known as slugworms and leaf skeletonizers of many cultivated trees and shrubs. The pear slug oviposits on the under sides of leaves of plum, pear, and cherry, and the eggs hatch in from 11 to 14 days, the feeding stage lasting from 18 to 21 days. *C. annulipes* Klug. oviposits on the upper surface of the leaves of *Salix*, *Crataegus*, *Prunus*, etc., the incubation period requiring from 13 to 15 days and the larval stage from 19 to 22 days. The rose sawfly appears to be confined to *Rosa* spp., *R. canina* and *R. arvensis* being preferred, the incubation period requiring from 9 to 14 days and the larval feeding period from 20 to 27 days.

Brood rearing by honeybees confined to a pure carbohydrate diet, M. H. Haydak (*Jour. Econ. Ent.*, *28* (*1935*). *No. 4*, *pp. 657–660*).—Work at the Wisconsin Experiment Station has shown that "adult bees can rear their brood when fed a pure carbohydrate diet. Brood rearing in this case continues for a relatively short period of time. For the production of the larval food, bees can use materials from their own body tissues, preferably those of the abdomen. The nitrogen content of the heads and thoraxes of the emerging bees reared by the colony on pure carbohydrate diet did not appreciably differ from that of the emerging bees produced by a colony which had been fed a normal diet under the same conditions. However, the nitrogen content of the abdomens was considerably lower in the former case. About as much nitrogen was used in the katabolism of the nurse bees and immature instars as was contained in the emerging bees which resulted."

The Mutillidae of eastern Asia, C. E. Mickel (*Lingnan Sci. Jour.*, *12* (*1933*), *No. 3*, *pp. 289–325*; *abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34*, *p. 46*).—The knowledge of the mutillid wasps in China, Indochina, and the Malay Peninsula is reviewed. There is a general discussion of the morphology and biology of these wasps, accompanied by keys to the genera and species known from this region and a bibliography of 24 titles. Twenty-six species and subspecies, representing 8 genera, are recognized, of which 5 are described as new to science.

Mutillidae of the Philippine Islands, C. E. Mickel (*Philippine Jour. Sci.*, *54* (*1934*), *No. 1*, *pp. 91–219*, *pl. 1*; *abs. in Minnesota Sta.* [*Bien.*] *Rpt. 1933–34*, *p. 58*).—This monographic account of the mutillid wasps of the Philippine Islands includes a historical survey of the literature; a discussion of the geographical distribution of the species and subspecies; keys for the identification of genera, species, and subspecies; and a bibliography of 20 titles. Sixty-nine species and subspecies belonging to 4 genera are recognized, 56 of which are described as new to science.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the twenty-seventh annual meeting, November 30 and December 1, 1934 (*Amer. Soc. Anim. Prod. Proc., 1934, pp. 270, figs. 5*).—This is the report of the annual meeting held at Chicago, November 30 and December 1, 1934 (E. S. R., 71, p. 358). The following papers were presented in the dairy cattle, beef cattle, horse, swine, sheep and lamb, nutrition, and meats sections:

High Standards in Live Stock Research, by W. E. Carroll (pp. 11–15); An Outline of the Supply and Utilization of Fats and Oils in the United States, by E. J. Working (pp. 16–20); The International Scope of the Oils and Fats Problem, by J. D. Craig (pp. 20–27); Competitive Position of American Lard, by T. W. Schultz (pp. 28–31); What Should Be the Ultimate Aim of the United States Regarding the Utilization of Fats and Oils? by N. R. Whitney (pp. 32–43); Minerals in the Nutrition of Dairy Cattle, by C. F. Huffman (pp. 44–49); The Relation between the Color and Vitamin A of Butter and the Feed of the Cow, by H. T. Converse, H. G. Wiseman, and E. B. Meigs (pp. 50–54); Influence of Breed and Ration on the Carotene and Vitamin A Content of Milk, by W. M. Beeson (pp. 54–56); Factors Associated with Breeding Efficiency in Dairy Cattle, by A. B. Chapman and L. E. Casida (pp. 57–59); Feeding Cattle on Native Grass in Southwestern Nebraska, by M. L. Baker (pp. 60–62); Creep Feeding Range Calves, by E. B. Powell (pp. 63–65); Fattening Cattle on Pasture, by C. I. Bray (p. 65); The Forage Consumption of Grazing Steers, by W. P. Garrigus (pp. 66–69); The Effect of Fertilization on the Nutritive Value of Pasture Grass, by E. W. Crampton (pp. 69, 70); Developing New Types of Beef Cattle for Semitropical Conditions, by W. H. Black (pp. 71–73); An All-Purpose Supplement, by P. Gerlaugh (pp. 74–76); Early Cut versus Late Cut Soybean Hay as Feed for Stockers, by E. S. Good and W. J. Harris (pp. 77, 78); Methods of Utilizing the Corn Crop for Fattening Steers, by G. A. Branaman, G. A. Brown, and R. S. Hudson (p. 78); The Composition of Different Types of Steers, by P. E. Howe and O. G. Hankins (p. 79); Roughages in the Fattening Ration, by W. L. Blizzard (p. 80); A Horseman's Philosophy in Poetry and Prose, by D. J. Kays (pp. 81–84); The Partition of Calcium and Inorganic Phosphorus in Equine Serum, by P. B. Pearson and H. R. Catchpole (pp. 84–86); Horse Production in the Range Country, by D. W. Chittenden (pp. 87, 88); Iodine for Brood Mares, by B. W. Rodenwold and B. T. Simms (pp. 89–92); The Stallion Owner and Colt Development Projects, by P. T. Brown (pp. 92, 93); The Hay Requirement of Work Horses Receiving Corn and Cob Meal, by A. L. Harvey (pp. 97–100); Relative Efficiency of Limited and Full-feeding for Fattening Pigs in Dry Lot, by J. M. Saint-Pierre, F. B. Morrison, and J. P. Willman (pp. 101–104); Relation between the Refractive Index and the Moisture Content of the Fat and Muscle of the Pig, by E. H. Hughes (pp. 105–107); Testing the Comparative Palatability of Different Grains, by C. E. Aubel (pp. 107–109); Type Changes in an Inbred Stock of Swine, by W. A. Craft (pp. 110, 111); Production Records as a Basis for Selection, by E. F. Ferrin (pp. 112–114); The Nutritive Value of Packing-house By-products Prepared by the Wet and Dry Rendering Processes, by C. L. Shrewsbury and C. M. Vestal (pp. 115–120); Relation between Type in Hogs and the Plumpness of Their Hams, by O. G. Hankins (pp. 120–123); Soybean Oil Meals Prepared at Different Temperatures as Feed for Pigs, by J. W. Hayward, G. Bohstedt, and J. M. Fargo (pp. 123–126); The Relation of Vitamin A to the Eye Development in the Pig, by F. Hale (pp. 126–128); Ground Grain Sorghum Roughages for Fattening Lambs, by R. F. Cox and W. E. Connell (pp. 128–130); Teaching Wool Grading and Shrinkage Estimation, by E. H. Burns (pp. 131–139); Linseed Meal a Supplement for Alfalfa Hay and Corn for Growing and

Fattening Lambs, by T. B. Keith and W. L. Henning (pp. 140-142); Pasture Gains for Cattle, Cattle and Sheep, and Sheep, by M. G. Snell (pp. 142, 143); Ovarian Stimulation in Immature Farm Animals, by L. E. Casida (pp. 144, 145); Our Emergency Situation and Program with Regard to Sheep Production, by W. E. Morris (pp. 146-148); The Coming Five Years in the Purebred Sheep Business, by H. C. Gardiner (p. 151); A Report of Progress with Record of Performance Studies, by D. A. Spencer (p. 151); The Effect of a Low Protein Ration on the Prenatal and Postnatal Development of the Rat, by C. P. Thompson (pp. 177, 178); Rate of Growth in Relation to the Plane of Protein Intake, by A. G. Hogan, S. R. Johnson, and U. S. Ashworth (pp. 179-181); The Plane of Protein Intake as Affecting Food Utilization, by E. B. Forbes, R. W. Swift, A. Black, and O. J. Kahlenberg (pp. 181, 182); The Effect upon the Antirachitic Activity of Their Milk when Ewes are Exposed to Sunshine and Ultra-violet Rays, by W. G. Kirk, B. H. Thomas, and C. C. Culbertson (pp. 182-188); Calcium Carbonate vs. Calcium Sulphate in Swine Rations, by C. W. McCampbell and C. E. Aubel (pp. 189, 190); Variations in the Carotene Content of Farm Feeds, by L. A. Shinn, E. A. Kane, H. G. Wiseman, and C. A. Cary (pp. 190-192); The Effect of Ingesting Soybeans and Oils Differing Widely in Their Iodine Numbers upon the Firmness of Beef Fat, by B. H. Thomas, C. C. Culbertson, and F. Beard (pp. 193-199); Glandular Response to Fluorine in the Ration, by P. H. Phillips (pp. 200, 201); Meat in the Reducing Diet, by L. K. Campbell (pp. 232-235); Lard and Its Importance, by W. L. Lewis (pp. 235-237); and Retail Cutting Records of Yearling Cattle, by G. A. Brown and G. A. Branaman (pp. 238-240).

[Livestock investigations in Kentucky] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 38-42, 43, 44, 45, 47, 48, 56, 60, 61*).—Results obtained in tests with cattle and sheep are reported on late-cut v. early-cut soybean hay for wintering steers, finishing cattle in the barn and on pasture, rye pasture v. bluegrass pasture for ewes with lambs, and profitable lamb production.

In tests with swine information was obtained on pastures for hogs, a comparison of narrow and wide nutritive ratio in hog feeding, and profitable pork production.

With poultry, data were obtained in studies on marl as a source of calcium for laying hens, hemoglobin in hens and hemoglobin formation in eggs, the effect of vitamin D on embryonic mortality, incubation of turkey eggs, outcrossing Rhode Island Reds, feeding sorghum seed to poultry, and effect of artificial heat in a laying house.

Twelfth annual report [of the] activities of the National Live Stock and Meat Board for the fiscal year 1934-35, R. C. Pollock (*Natl. Livestock and Meat Bd. Ann. Rpt., 12 (1935), pp. 104, pls. 6, figs. 16*).—This report (E. S. R., 72, p. 89) contains accounts of investigations on meat nutrition and the quality and palatability of meat. Brief accounts are also included on the publicity and information regarding meat that were disseminated during the year.

Yield and chemical composition of certain species of grass, J. G. Archibald and E. Bennett (*Jour. Agr. Res.* [*U. S.*], *50 (1935), No. 8, pp. 711-715*).—The Massachusetts Experiment Station reports 3 years' results of a chemical study of the common grasses grown as pure or practically pure stands of the individual species. The analyses are given in tabular form.

As a whole the outstanding features of the investigations were the high rank of white clover in almost every respect, the high soluble ash and phosphorus content of orchard grass, the high calcium content of Rhode Island bent, the low rank of sheep fescue in every respect except yield, and the rather low rank of Kentucky bluegrass.

Nutritive value of lucerne.—III, The composition, digestibility, and nutritive value of lucerne hay, lucerne meal (English and American), and lucerne leaf meal (American), H. E. WOODMAN and A. EDEN (*Jour. Agr. Sci. [England], 25 (1935), No. 1, pp. 50–70*).—Continuing this investigation (E. S. R., 72, p. 234), a study was made of the composition, digestibility, and nutritive value of alfalfa hay, meal, and leaf meal. Two samples of the hay studied were baled direct from the field, while the third was stacked. The hay had a slightly lower digestibility and feeding value than the green crop from which it was made, and only the fiber showed an improved digestibility. Hay made from alfalfa cut in the early flower stage had approximately the same starch equivalent as a good grade of meadow hay. It was somewhat more fibrous but almost twice as rich in digestible protein and almost three times as rich in lime as the meadow hay.

Of the samples of alfalfa meal examined, two were made by grinding artificially dried hay and the other was an American sample of ground sun-dried alfalfa. The meals kept for long periods without deterioration or significant increase in moisture if stored in a cool dry place. The meal from artificially dried alfalfa contained as much ether extract as the green crop, and on the basis of dry matter resembled in composition the alfalfa used in its manufacture. Grinding did not increase the digestibility of the nutrients of the meal, and the drying process appeared to depress the digestibility of the crude protein. Artificial drying produced the most uniform meal with the highest digestible protein and starch equivalent content.

Alfalfa leaf meal showed a relatively high digestibility, digestible protein, and starch equivalent content. In these respects leaf meal resembled whole meal made from alfalfa in the prebudding stage, but the leaf meal was preferable since the early cutting of alfalfa was hard on the stand.

The results of this and previous studies showed the superiority in digestibility and starch equivalent of dried grass cut at 1- or 5-week intervals over all forms of alfalfa meal and alfalfa leaf meal. It was undesirable to grind alfalfa to a fine dusty meal for cattle and sheep, but for pigs and poultry the use of such a product was satisfactory.

The neutralizing power of forage crops for organic and mineral acids, J. K. WILSON (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 317–325, figs. 8*).—At the [New York] Cornell Experiment Station, a study was made of the ability of such forage crops as alfalfa, vetch, timothy, barley, oats, corn, and bluegrass to neutralize organic and mineral acids. Finely ground portions of the crops were exposed to acids of known strength, and any change in the intensity factor of the material was noted.

Leguminous materials required more acid to produce a change of 1 pH unit than was needed by nonleguminous materials, and both types required more acid to change their reaction 1 unit in the region of pH 4 than in the region of pH 6.5. The strong mineral acids were more effective than the organic acids. From the data it seemed doubtful whether certain leguminous materials contained a sufficient quantity of the fermentable carbohydrates which if converted quantitatively into organic acids would produce an intensity factor comparable to that found by other investigators in good types of silage made from crop materials containing a larger percentage of fermentable sugars. It is concluded that this was probably the main reason for the many failures to produce silage from leguminous crops.

Commercial feeding stuffs—report on inspection, 1934, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 370 (1935), pp. 309–417+XVII–XLI*).—This is the usual report of the guaranties and analyses of 1,461 samples of

feeding stuffs collected for official inspection during the calendar year 1934 (E. S. R., 71, p. 823).

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 387 (1935), pp. 48*).—This is the usual report of the analyses for protein, fat, and fiber of 2,049 samples of feeding stuffs collected for official inspection during December 1934 (E. S. R., 72, p. 673).

The control of variation in gain in animal nutrition experiments, G. DUNLOP (*Jour. Agr. Sci. [England], 25 (1935), No. 1, pp. 151–159, fig. 1*).—Further investigations (E. S. R., 72, p. 670) were made on the cause of variation in the live weight increase of animals on experiment.

The present study indicated that differences in the proportion of fat to protein laid down affected the magnitude of the gains of the animals. Measurements of the thickness of back fat were found to be a reliable index to the percentage of fat in the carcass and hence to the proportion of fat to protein laid down. By correcting the observed live weights by a factor incorporating these back fat measurements, the gains could be calculated on an equal energy basis. These "corrected live weights" show little variation among individuals on one treatment. The advisability of obtaining back fat measurements according to the method of Hankins and Ellis (E. S. R., 71, p. 363) is discussed. Equalization of the food intake over the experimental period allowed for comparatively large variations in live weight gains, but the necessity of keeping the plane of nutrition constant is stressed.

The effect of the saturated fatty acid content of the diet on the composition of the body fat, A. D. BARBOUR (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 281–288*).—The saturated acid content of the body fat of rats fed fat at a 20-percent level was proportional to the saturated acid content of the diet. The unsaturation of body fat as measured by iodine value was proportional to the unsaturation of dietary fat. Feeding fats of low saturated acid content lowered the saturated acid content of body fat, but the level of saturated acid content could not be raised beyond 25 to 27 percent by feeding fats of higher saturated acid content. In the latter case the excess saturated acid was excreted in the feces. Linseed oil, peanut oil, cottonseed oil, and lard, when fed at a level of 20 percent in an otherwise normal diet, did not cause abnormal deposition of fat in the liver. The arachidic acid of peanut oil was almost quantitatively excreted by rats, and if present in the body of rats fed peanut oil the concentration did not exceed 0.1 percent.

Wintering and fattening beef cattle in Alabama (*Alabama Sta. Leaflet 15 (1935), pp. 3*).—Rations for wintering and fattening beef cattle are given, together with suggestions on methods of feeding.

Studies on the relationship between nutrition and wool production of Merino sheep, I, II, H. R. MARSTON (*Jour. Agr. Sci. [England], 25 (1935), No. 1, pp. 103–112, figs. 3; 113–131*).—These papers are from the University of Adelaide.

I. *The technique employed for determining the utilisation of foodstuffs and for estimating the wool produced over short periods by Merino sheep*.—The author describes the type of metabolism crates used in this experimental work and the technics employed for sampling fodder and urine, in choosing the animals for the experiment, and in estimating the wool growth over short periods.

II. *The effect of the administration of cystine, cystein, sulphur, and of methionine on the growth of wool of a Merino ewe on a protein-poor ration*.—A Merino ewe was fed a ration which previous experience had shown would maintain the weight of an animal weighing about 40 kg when kept in a pen and would permit production of about 60 percent of the wool it usually grew on pasture and somewhat less than 50 percent of its full capacity.

When 1 g of levocystine was added to the above low-protein diet, the wool growth upon a circumscribed area was 14 percent more than that grown during a similar period immediately preceding. Of the added cystine four-fifths of the sulfur was absorbed, and about one-half of this was excreted in the urine during the period of cystine feeding. Injecting 1 g of levocysteine subcutaneously each day for 10 days caused a 84-percent increase in wool growth. During three succeeding 10-day periods immediately after the investigations were discontinued the wool growth increases were 80, 18, and 7 percent, respectively. Of the 2.6 g of sulfur in the injected cysteine 1.7 g were retained and could be accounted for by the extra amount of wool grown during the experimental and succeeding periods. Adding 1 g of sulfur to the daily ration caused no increase in wool production, and 40 percent of the extra sulfur was excreted in the urine. With this supplement there was no increased retention of nitrogen. When methionine was injected a small but doubtful significant increase in wool growth occurred. The greater weight of wool resulting from cysteine injections was due to increases in both length and mean diameter of the fibers.

Sheep breeding and wool production in the Argentine Republic, P. Link (*Buenos Aires: [Author], 1934, pp. 42, figs. 22*).—This paper gives a description of sheep breeding and wool production in Argentina from their early beginnings to the present date.

The chemistry of embryonic growth.—III, A biochemical study of the embryonic growth of the pig with special reference to nitrogenous compounds, V. A. Wilkerson and R. A. Gortner (*Amer. Jour. Physiol., 102 (1932), No. 1, pp. 153–166; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 29, 30*).—In this investigation at the Minnesota Experiment Station detailed studies were made of 1,552 pig embryos varying in length from 2 to 4 mm to 240 mm.

The total nitrogen decreased gradually until the 50-mm stage was reached, and then remained practically constant throughout embryonic life. The amide nitrogen, humin nitrogen, and cystine nitrogen showed no significant changes, and the total nitrogen of the bases was constant throughout. The basic amino nitrogen increased, while the basic nonamino nitrogen decreased. The most marked changes were a decrease in arginine and hystadine and an increase in lysine. These changes occurred before the 30-mm stage was reached and were quite definite. The nitrogen of the filtrate from the "bases" and tyrosine also showed a distinct decrease. Glutathione increased rapidly, reaching a peak at 30 mm, and then declined. It is suggested that this product aided in protein synthesis and in the production of proline and oxyproline.

Total sulfur increased rapidly to the 50-mm stage and then gradually declined. Ash showed an initial increase between the 10- and 15-mm stages, followed by a slight but constant decrease to the 30-mm stage, then by a rapid rise to the 50-mm stage, and by a constant but more gradual increase to the 240-mm stage. There was a rapid decrease in total water from the 4-mm to the 15-mm embryo, after which it was constant until the 160-mm stage was reached. There was a gradual decline in the water content from this stage until birth, with final water equilibrium being reached at an early period in postnatal life.

The relationship between embryonic chemistry and tumor chemistry is discussed. The study also shows that the mammalian embryo follows certain definite and fixed chemical courses during development which appear to be governed by the inherent nature of the embryo itself and the specific selective absorption of the placenta rather than any variations in maternal nutrition.

The chemistry of embryonic growth.—IV, The requirement of the pig embryo for copper, V. A. Wilkerson (*Jour. Biol. Chem., 104 (1934), No. 3, pp. 541–546; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 76*).—Continuing

the above study. It was found that there was a constant increase in copper content throughout the embryonic period and, therefore, a demand for the element by the growing embryo. There was a continual increase in copper up to the 30-mm stage, followed by a steady decrease. It was thought that these trends were relative rather than absolute, and were due to a more rapid influx of calcium, phosphates, and iron following the 30-mm stage.

The liver of the 10- to 20-mm embryo represented 14 percent of the total weight and contained practically 100 percent of the copper, while the liver of the 160-mm embryo represented only 4 percent of the total weight and contained about 66 percent of the total copper. The percentage of copper in the livers and the liver ash was constant throughout. The blue color of the ash in the early stages of embryonic growth was due to the relatively greater amount of copper present in the ash. There was also an affinity of the hyaline cartilage of the embryo for the copper in solution.

The calcium, phosphorus, and vitamin D requirements of swine, G. DUNLOP (*Jour. Agr. Sci. [England], 25 (1935), No. 1, pp. 22–49, fig. 1*).—Experiments were conducted with 156 pigs from weaning to bacon weight at the Animal Nutrition Research Institute, Cambridge, to obtain information as to the requirements of swine for calcium, phosphorus, and vitamin D for normal bone development, and to allow for adequate growth and development. The reaction of the pigs to the different treatments was studied in relation to growth, appetite, utilization of feed, blood serum calcium, blood inorganic phosphate, blood serum phosphatase, hemoglobin, and the morphology and chemical composition of the bone. These results are given in tabular form. The different levels of calcium and the calcium-phosphorus ratios which produced either normal or abnormal physiological conditions are plotted in graphic form along with results, similarly treated, of investigations by other workers.

Blood phosphatase was found to be lowest in concentration when the calcium-phosphorus ratio of the diet was 1 : 2. There was evidence to indicate that the composition of the cereal portion of the ration had some effect on the phosphorus requirements of the animal, this effect being ascribed to the varying amount of phytin phosphorus in the different cereals. While the true requirement for calcium and phosphorus was dependent upon rate of growth and economy of gain, the results of the study indicated that a diet with a calcium level of 0.45 percent of the dry matter and a calcium-phosphorus ratio of 1 : 1.5 was optimal when the average daily rate of growth between the weights of 30 and 200 lb. varied from 1 : 1.4, and the feed required per pound of live weight increase varied from 3 to 4 lb. of dry matter.

The effect of grinding on the digestibility of corn by pigs and on its content of metabolizable energy, W. P. GARRIGUS and H. H. MITCHELL (*Jour. Agr. Res. [U. S.], 50 (1935), No. 9, pp. 731–735*).—The Illinois Experiment Station studied the relative digestibility of whole and ground corn and their contents of metabolizable energy, using 5 pigs ranging in weight from 135 to 196 lb. Each pig received daily either 1,300 or 1,500 g of corn alone, depending upon appetite. The feeding periods consisted of from 14 to 17 days, during the last 10 days of which both feces and urine were collected.

Grinding to a medium degree of fineness increased the digestibility of the protein by 13 percent but raised the digestibility of the gross energy only 2.8 percent and that of the metabolizable energy only 3.5 percent. The appreciable advantage in protein digestibility due to grinding was largely lost by greater losses of nitrogen occurring in metabolism, so that the net effect on the nitrogen balance of an animal receiving an exclusive diet of corn was slight and inconstant. The net effect of grinding upon the nutritive value of corn for the

pigs in this experiment was to increase its value as a source of energy by 3.5 percent.

Use of forage crops for growing and fattening swine, E. Martin (*Arkansas Sta. Bul. 321 (1935), pp. 32*).—This work, begun in 1926, was undertaken to compare the value of different forage crops for swine under different methods of feeding. Ten trials were carried out with approximately 450 pigs.

Sudan grass and sweet sorghum were both superior to soybeans and cowpeas when grazed at the rate of 16 pigs per acre, due to their ability (especially that of the Sudan grass) to withstand heavy grazing. When grazed alone soybeans were superior to cowpeas. Growing either of the latter crops with Sudan grass did not improve the value of the forage as compared with Sudan grass alone. Neither soybeans nor cowpeas were as palatable as Sudan grass. When grazed without a protein supplement Sudan grass was superior to sweet sorghum, particularly when kept grazed closely. When grazed with tankage as a supplement to corn and minerals, sweet sorghum was practically equal to Sudan grass in rate and economy of gains. Self-feeding a mixture of equal parts of tankage and cottonseed meal to pigs with an initial weight of 70 lb. reduced the time to market weight approximately 2 weeks, but the feed required per unit of gain was somewhat less when tankage was the only supplement.

Winter oats, rye, and wheat were approximately equal as winter pastures for swine. Fall pigs weighing 70 lb. were successfully and economically finished on these pastures when self-fed corn and minerals. The cereal pastures planted in the fall made more useful pastures in January and February than soybeans planted in the spring and carried over for winter grazing. When fed on good pasture, white corn was as efficient as yellow corn. Pigs weighing approximately 83 lb. could not be successfully fattened in dry lot with either white or yellow corn supplemented only with minerals, but pigs so fed made rapid and economical gains when placed on good pasture supplemented with enough protein of the right quality. It was usually profitable to self-feed tankage in addition to self-feeding corn and minerals to fattening pigs on pasture. Pasture showed to the best advantage, as compared with dry-lot feeding, when the ration consisted of corn and minerals self-fed.

Good pastures improve the pig crop, A. G. Hogan and S. R. Johnson (*Missouri Sta. Circ. 187 (1935), pp. 4, figs. 2*).—In this test, all the sows used received a ration of yellow corn, tankage, linseed meal, alfalfa meal, cod-liver oil, and minerals from the time they were weaned. Care was taken to see that they received no feed that could not be accounted for. The pigs farrowed from these sows were usually normal at birth and for a few days afterward, but from this time on deaths occurred until weaning time. The cause of deaths could not be attributed to starvation, and if the ration was not changed none of the remaining pigs was thrifty at weaning time. Supplying the pigs with the juice of fresh, rapidly growing forages healed those that had developed paralysis and prevented the appearance of this condition in other animals. It also caused the prompt recovery in scouring pigs. The results showed that sows on defective rations secrete defective milk and emphasized the importance of pastures for brood sows.

Inorganic phosphorus of horse serum: The effect of age and nutrition, P. B. Pearson (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 1–6, fig. 1*).—Studies at the California Experiment Station showed a high negative correlation -0.768 ± 0.066 between the age of the growing horse and the inorganic phosphorus content of the serum. At maturity the inorganic phosphorus tended to approach a constant level, but this level was affected by an inadequate phosphorus intake. The inorganic phosphorus of the serum of horses grazed on dry forage was significantly lower than that of horses receiving a limited

amount of grain and green feed and a liberal allowance of hay. Recovery from hypophosphoremia was effected within 8 days after changing from a phosphorus-deficient to an adequate phosphorus intake.

Working dogs, E. HUMPHREY and L. WARNER (*Baltimore: Johns Hopkins Press; London: Oxford Univ. Press, 1934, pp. XIV+253, figs. 52*).—This treatise records each step for the breeding, feeding, and training of dogs to fit definite specifications over a wide range of needs and uses.

Relation of body weight and egg weight in the domestic fowl, E. M. FUNK (*Poultry Sci., 14 (1935), No. 4, pp. 232–236*).—The Missouri Experiment Station found in White Plymouth Rocks a significant correlation between body weight at sexual maturity and the mean weight of the first 10 eggs, even after eliminating the influence of age and date of sexual maturity. Body weight at sexual maturity and mean annual body weight were also significantly correlated with mean annual egg weight, but the coefficients were reduced by eliminating the age and date of sexual maturity. Maximum mean monthly egg weight and body weight the same month were found to be correlated

The influence of commercial limestone and mica grits upon growth, feed utilization, and gizzard measurements of chicks, C. S. PLATT and A. B. STEPHENSON (*New Jersey Stas. Bul. 587 (1935), pp. 26, figs. 3*).—In this study 5 lots of 50 crossbred chicks each were fed all-mash rations in batteries up to 12 weeks of age. The respective rations were supplemented as follows—no grit, 3.3 percent of limestone grit (commercial), 3.3 percent of mica grit (commercial), 6.5 percent of equal parts of limestone and mica grit, and 6.5 percent of mica grit. The mica grit contained 97.7 percent of material that exceeded 1 mm in diameter, while the limestone grit contained only 18.5 percent of such material. At intervals during the test two birds from each group were killed and their gizzards measured. At the end of the period the remaining birds were killed and measurements taken of the gizzard and its intestinal contents.

There was no significant difference in the body weight of birds receiving 3.3 percent of either limestone or mica grit or 6.5 percent of the combined grits at 12 weeks of age, but birds receiving 6.5 percent of mica grit were 13.2 percent heavier at the end of the test than the check lot. The economy of feed used was not influenced by the grit, but the birds receiving grit rations consumed more total feed. At the end of the test there was a variation of from 0.2 g of gritlike material in the gizzards of birds receiving no grit to 4.1 g in the gizzards of birds receiving 6.5 percent of mica grit. However, there was a wide variation in the amount of grit in the gizzards of birds receiving the same ration. The coefficient of correlation between the weight of grit in the gizzard and body weight was 0.2331±0.049. Limestone grit more than 1 mm in diameter appeared to be retained in the gizzard as long as, or longer than, mica grit of similar size. The use of the mica or combined grits at levels of 6.5 percent had a significant tendency to increase all gizzard measurements, especially width and thickness.

Changes in the blood calcium and phosphorus partition during the life cycle of the chicken, V. G. HELLER, H. PAUL, and R. B. THOMPSON (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 357–364, figs. 2*).—At the Oklahoma Experiment Station analyses were made at regular intervals during the life cycle of the chicken of the complete calcium and phosphorus distribution in the blood. It was observed that there were definite changes not only in totals but in certain partitions at various periods.

The absorbable filtrable calcium decreased at the time of egg production, while the other fractions greatly increased. The totals for both calcium and phos-

phorus showed pronounced increases at the time of egg production and returned to former levels at molting time. In comparing distributions of the blood of normal chickens and those affected with osteoporosis, a significant tendency toward regular changes in certain fractions of both calcium and phosphorus was found, indicating the possibility of correlating such analyses and ossification.

Relation of depot fat to egg yolk fat in laying hens, H. J. ALMQUIST, F. W. LORENZ, and B. R. BURMESTER (*Jour. Biol. Chem., 106 (1934), No. 1, pp. 365–371*).—At the California Experiment Station it was found that the fat-soluble substance responsible for the Halphen test was deposited in the depot fat and yolk fat of hens eating malvaceous plants or products of these plants containing crude malvaceous fat. When yolks present at the time of malvaceous fat ingestion were removed by normal laying or by operative procedure a positive Halphen test was not obtained in subsequently formed yolk fat, although the test may remain strongly positive in depot fat. This latter fat was not used to any important extent in the formation of yolk fat.

Vitamin A content of eggs produced by chickens fed viosterol and various percentages of cod-liver oil, G. M. DEVANEY, H. W. TITUS, and R. B. NESTLER (*Jour. Agr. Res. [U. S.], 50 (1935), No. 10, pp. 853–860*).—This cooperative investigation between the U. S. D. A. Bureaus of Home Economics and Animal Industry was undertaken to determine what effect, if any, the addition of viosterol to the diet of laying hens might have on the vitamin A content of the eggs.

Feeding vitamin D in the form of 0.5 percent of viosterol 160 D to laying birds receiving graded quantities of cod-liver oil had no apparent effect on the transfer of vitamin A to the egg. Eggs from pullets fed 8 percent of cod-liver oil were several times more potent in vitamin A than eggs from pullets fed 1 and 2 percent of cod-liver oil. It has been shown, however, that between 1 and 2 percent of cod-liver oil in the diet is the optimum level for chickens, and when this level is exceeded impairment in egg production and hatchability is likely to occur. No significant difference was demonstrated between eggs from birds fed 1 and 2 percent of cod-liver oil, but it was felt that if more test birds had been used a significant difference in favor of the higher level would have been demonstrated.

The vitamin A potency of eggs from birds on diets containing no vitamin A and D supplements was significantly less than the potency of eggs from groups fed cod-liver oil. The eggs from birds receiving no vitamin A and B supplements had about 20 units (Sherman-Munsell) of vitamin A per gram of egg yolk, those that received 8 percent of cod-liver oil had about 80 units, and those that received 1 or 2 percent of cod-liver oil about 40 units.

Studies relative to the estimation of vitamin D, L. L. LACHAT, H. A. HALVORSON, and L. S. PALMER (*Jour. Assoc. Off. Agr. Chem., 15 (1932), No. 4, pp. 660–675, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 53, 54*).—The results of a cooperative study between the Minnesota Department of Agriculture and the Minnesota Experiment Station are reported on the effects of 18 rickets-producing rations when fed to chicks.

A ration which gave an excellent growth and produced uniformly low bone ash values at 5 weeks of age was used to obtain vitamin D assays on 22 products. The products included 11 cod-liver oils, 4 cod-liver oil concentrates, 2 proprietary feed supplements, 1 sardine oil, 1 burbot-liver oil, 1 cod-liver meal, 1 mineral feed concentrate, and 1 cod-liver oil stearin. A rather wide variation was found in the vitamin D potency of the different products.

A statistical analysis of the data showed that a 4-week feeding period, with the methods used in this investigation, was as accurate as a 5-week feeding period.

The vitamin E content of eggs as related to the diet of the hen and to hatchability, G. L. Barnum (*Jour. Nutr., 9 (1935), No. 5, pp. 631–635*).—The U. S. D. A. Bureau of Animal Industry reports the results of a study on the influence of the diet on the vitamin E content of hens' eggs. The presence and stability of vitamin E in the hen diets were made by means of rat-feeding tests.

By varying the diet it was found possible to produce eggs varying widely in hatchability. Eggs produced on a normal diet were partially effective at a 3 cc level in the curative type of experimental rat test, but 10 cc of eggs from a deficient diet were not effective. Prophylactic egg tests with male rats gave results which agreed in general with the female rat tests.

The normal diet which produced eggs of moderately high hatchability was found to be potent in vitamin E when tested with female rats. Rations which produced eggs of low hatchability, especially marked by a high first week embryonic mortality, were low or lacking in vitamin E provided the rats received cod-liver oil. In the absence of cod-liver oil the rat tests showed little difference in vitamin E content from the normal diet. Supplementing the deficient diet with 15 percent of wheat germ resulted in eggs comparable in vitamin E content to those produced on the normal diet. Adding one head of lettuce per seven birds daily did not increase the vitamin E content or markedly improve hatchability, but did reduce the first 4-day embryonic mortality over that of the deficient diet.

It is concluded that vitamin E may be a limiting factor in hatchability on certain types of diets, and that one manifestation of the deficiency is the first week embryonic mortality.

Classification of chick-embryo positions at different ages and malposition as a cause of mortality, W. F. Dove (*Jour. Agr. Res. [U. S.], 50 (1935), No. 11, pp. 923–931, fig. 1*).—A systematic classification of the positions taken by normal-hatching chick embryos and by the dead-in-the-shell at the Maine Experiment Station showed that position, as such, was not always and may only occasionally be the real cause for failure to hatch. Positions reported by other investigators have been found to occur in hatchable chicks with a frequency equal to that found in dead-in-shell chicks or were due to a delayed development taking effect prior to the fifteenth day of incubation. Defective embryos in new positions were associated with the nutrition of the dam. Postdiction of the causes of failure to hatch from position of the embryo become apparent only after conditions are resolved into the effects of breeding, feeding, and incubation methods, many of which bring about a delay in the normal shift in position as a secondary aftereffect of the true lethal factor.

A position code based upon a combination of independent and mutually exclusive events for the classification of embryos is presented. By the use of this code the position of any embryo may be easily described with four letters.

Hen batteries, E. W. Callenbach and H. C. Knandel (*Pennsylvania Sta. Bul. 314 (1935), pp. 19, fig. 1*).—This experiment was conducted with four groups of 48 Barred Plymouth Rock pullets each in batteries and with four duplicate groups in pens of a long-type laying house for a 44-week period. The same test was conducted with White Leghorn pullets over a 52-week period.

The pullets in laying houses consumed smaller amounts of mash and greater amounts of scratch grain, and had a greater total feed intake than comparable birds in batteries. Egg production was less variable in the hen battery groups. Total production was greater in batteries with the Barred Rocks, and greater in the laying house with the Leghorns. Fall and winter production was higher in the battery groups, while spring and summer production was higher in the

laying house. The method of rearing and managing layers had no effect upon average annual egg weight.

The battery birds weighed more at sexual maturity and at 48 or 52 weeks than the laying-house birds, with the difference being greater in the Barred Rock groups. Recorded egg breakage was higher for the battery groups, especially with the Barred Rocks, but much of the difference was due to the impossibility of recording accurately the egg breakage in floor pens. There was practically no difference in the average percentages of marketable eggs laid by the two groups of Barred Rocks, but the laying-house groups of Leghorns produced more of these eggs than the similar lots in batteries. There was no significant difference in the mortality of the two groups of Barred Rocks, but there was 13.8 percent greater mortality in the White Leghorns in the laying house.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Kentucky] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 45, 46, 47*).—Results obtained in these studies are reported on delayed conception and sterility in dairy heifers, quality of butter as related to grade of cream, and cost of producing milk and butterfat.

The Hannah Dairy Research Institute annual report for the year ending 31st March, 1935 (*Hannah Dairy Res. Inst., Ann. Rpt., 6 (1935), pp. 16, pls. 2*).—In this sixth annual report a summary of research as conducted at the institution with dairy cattle and dairy products is given (E. S. R., 73, p. 375).

Bacteriological examination of a number of silages prepared with the addition of inorganic acids [trans. title], J. van Beynum and J. W. Pette (*Dept. Econ. Zaken [Netherlands], Verslag Landbouwk. Onderzoek., No. 39 C (1933), pp. 545–565, pls. 3; Eng. abs., pp. 564, 565*).—Because the feeding of silage affected milk so that cheese made from it developed large quantities of gas, especially during the spring months when the temperature was above normal, the Agricultural Experiment Station, Hoorn, made a study to determine the presence or absence of butyric acid bacteria in silage prepared with the addition of inorganic acids.

Five cows were fed silage and the milk produced was made into cheeses of Gouda shape. Although the content of butyric acid bacteria in the silage used was not the highest among the samples of silages examined, all the cheeses showed heavy gassy fermentation when exposed to a temperature of 18.5° C. Photographs of the cheese showed the typical butyric fermentation. These results showed that butyric acid bacteria in silage artificially acidified with inorganic acids were even more dangerous than those present in the ordinary Dutch silage. This was believed to be due to the fact that the acid destroyed some bacteria which tended to hold the butyric acid bacteria in check.

Relation of pressure to rate and quality of milk secreted, W. E. Petersen and T. V. Rigor (*Soc. Expt. Biol. and Med. Proc., 30 (1932), No. 2, pp. 254–256; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 35*).—In this investigation at the Minnesota Experiment Station efforts were made to determine the amount of pressure developed in the udder of a cow by the accumulating secretion, the effect of such pressure upon the rate of secretion, and the maximum pressure against which milk would be secreted by (1) determining the maximum pressure developed in the udder by means of a manometer, and (2) determining the maximum pressure against which milk was secreted by applying air pressure in the duct system.

It is concluded that as the pressure developed in the udder the rate of secretion decreased. When a pressure equal to 25 mm Hg was developed, secretion stopped and resorption set in.

Effect of delayed milking upon composition of cow's milk, W. E. Petersen and T. V. Riggs (*Soc. Expt. Biol. and Med. Proc., 30 (1932), No. 2, pp. 257–259, fig. 1; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 35, 36*).—Continuing the above study, the composition of milk retained in half the udder for periods ranging from 24 to 120 hr. was compared with the composition of milk from the other half of the udder milk at regular 12-hr. intervals and with normal milk obtained from the same animals in a preliminary period.

It was shown that the total solids, fat, and lactose decreased with the length of time the milk was retained. Lactose rapidly diminished from nearly a normal of 5 percent to less than 1 percent for milk retained 120 hr. The protein, ash, and pH values increased as the milk was retained. The ash increase was due to an increase in chlorides, but there was a decrease in both calcium and phosphorus. The character of the protein was changed also.

Osmotic pressure and milk secretion, W. E. Petersen and T. V. Riggs (*Soc. Expt. Biol. and Med. Proc., 30 (1932), No. 2, pp. 259–264, figs. 8; abs in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 35*).—Continuing these studies, the effect of osmotic pressure on milk secretion was determined by introducing into the duct system of udders solutions of four different osmotic pressures—distilled water, isotonic, hypotonic, and hypertonic. These solutions were introduced immediately after milking and in amounts equal to the milk withdrawn.

The depressing effect upon the amount of secretion was in direct proportion to the concentration of the solutions. The amount of secretion was approximately ⅘ N for distilled water, ½ N for hypotonic, ⅕ N for isotonic, and ¹⁄₁₀ N for hypertonic. These results clearly indicated a selective absorption of the solutes. There was no significant difference in the effect of electrolyte and nonelectrolyte solutes. The character of the milk secreted was altered also, the lactose decreasing with increases in the osmotic pressure of the solutions injected. The percentage of protein was the reverse of that of lactose.

An analysis of the time change in milk production in individual lactations, M. Gooch (*Jour. Agr. Sci. [England], 25 (1935), No. 1, pp. 71–102, figs. 5*).—The material used in this analysis was based on the monthly milk production records of 99 cows having six or more lactations in a single large herd of purebred Jerseys, a total of 679 lactations. Since the trend in the amount of milk produced in a lactation could be described by a simple exponential curve, this equation was fitted to the first 8 months' production for each lactation. From these curves constants were obtained which measured for each lactation (1) the theoretical initial yield, (2) the decline of milk yield with time, and (3) the scatter of the observed monthly yields about the smooth curve.

There was a negative correlation between the persistency factor and the initial yield, but no correlation between the scatter of the observed monthly yields about the fitted line and either persistency or initial yield. The trend of the 8 months' total yield indicated that there had been some selection of cows for a high yield but no apparent selection for persistency. Total yields showed a slight negative correlation with both persistency and variability of monthly yields. The theoretical initial yield was closely correlated with production during the early part of the lactation.

The trend of milk production during a lactation was related to the season when the cow freshened, the more persistent milkers beginning in the winter months. The deviations of monthly yield from the smooth curve showed no seasonal variation. Younger cows were more persistent, while older cows started at a higher level and deviated more widely from the fitted curve. The length of gestation showed no effect on the trend. The length of the resting period and length of time milked showed a relation to all three constants describing trend. A resting period of more than 8 weeks was associated with

an increased initial yield, a decreased persistency, and a larger deviation of monthly yields from the smooth trend. Cows milked for a longer period tended to be more persistent, to start their production at a relatively low level, and to be less variable. There was a greater variation between lactations of the same cow than between cows in both initial yield and persistency. Age differences increased the variation in persistency very little, but had more effect on variation in initial yield.

The study showed that the amount of milk a cow gives at the beginning of her lactation is an important figure diagnostic of her ultimate worth as measured by total yield. Breeding for high producing cows will not reduce the variability of a herd to a low level unless the individual cows have greater uniformity in trend of individual lactations than the herd tested.

Comparative efficiency of farm milk coolers, G. H. Wilster, H. Hoffman, and F. E. Price (*Oregon Sta. Bul. 331 (1934), pp. 42, figs. 12*).—A series of experiments was undertaken to compare the efficiency of such types of milk coolers as the tubular surface cooler, a sprinkler cooler, a tub cooler, and a Hydro-Vac cooler. The last-named is a piece of apparatus which can be placed on the shipping can and attached to the water supply pipe by means of a hose. As the water enters the cooler it flows through a water jet creating a suction which may eliminate odors from the milk. The water is propelled against a water wheel, which turns a small propeller in the can, and finally flows in a continuous film down the sides of the can.

In tests with the surface cooler it was found that the rate of water flow up to 6 gal. per minute, the temperature of the water, and the rate of milk flow over the cooling surface all markedly affected the rate of cooling and the final temperature attained by the milk. With the Hydro-Vac cooler the length of the cooling period and the temperature of the cooling water affected the time required to cool milk and its final temperature. In five tests with a surface cooler with 80 lb. of milk at 90.4° F. the water flowing at the rate of 4 gal. per minute at 52°, it required 10 min. to cool the milk to an average temperature of 56.7°. Under the same conditions the Hydro-Vac cooled the milk to 59.5°. With the cooling water at 54° and water flowing at the rate of 4 gal. per minute, it required 15 min. with a Hydro-Vac cooler, 60 min. with a sprinkler cooler, and 90 min. with a tub cooler to cool 80 lb. of milk from 90° to 58°.

A comparison of the bacterial contamination of milk cooled by a sterilized tubular surface cooler and with a sterilized Hydro-Vac cooler showed that in either case the contamination was very small. It was calculated that with a sterilized surface cooler 10 gal. of milk would be contaminated with 0.62 bacterium per cubic centimeter during cooling and 0.05 bacterium per cubic centimeter as a result of contact with the air.

On the basis of scoring by three judges for odor and flavor, milk cooled with the Hydro-Vac ranked first, followed in descending order by milk cooled with a surface cooler, that cooled with a tub cooler, and that not cooled. At the end of a 24-hr. setting period it was found that the cream volume per 1 percent fat in the milk which had not been cooled and in milk cooled with the surface cooler was 4.4 percent of the total milk volume, in milk cooled with the Hydro-Vac 4.3 percent, and in milk cooled with the tub cooler 4.6 percent.

Freezing and thawing of raw milk: Effect upon formation of cream layer, F. B. Baldwin, Jr., and W. B. Combs (*Milk Plant Mo., 22 (1933), No. 2, pp. 32, 34, 36; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 57*).—The Minnesota Experiment Station undertook a study to obtain definite information concerning the effect of partial freezing and thawing of raw milk upon its ability to form a cream layer. The procedure was similar to that previously noted (E. S. R., 69, p. 260).

It is concluded that the partial freezing of raw milk did not affect the creaming ability of the milk. The method employed in thawing the partially frozen milk played the major role in influencing the creaming ability.

Some physical effects of freezing upon milk and cream, B. H. WEBB and S. A. HALL (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 275–286, figs. 2*).—The results of an investigation by the U. S. D. A. Bureau of Dairy Industry showed that the slow freezing of milk or cream caused a gradual precipitation of the caseinate system and an immediate destruction of the fat emulsion. Freezing did not alter the heat stability of skim milk until the product had been held frozen for several months at −18° C. (0.4° F.) or lower. Freezing caused an immediate increase in the amount of casein that could be centrifuged from milks heated before freezing. Freezing also caused a slow and gradual increase in the size of the casein aggregates, but the change was not apparent until the freezing period was well advanced.

The addition of cane sugar or increasing the solids-not-fat content of cream before freezing lessened the destruction of the fat emulsion during slow freezing. Homogenization of low fat creams slightly retarded fat separation of the frozen cream. The fat clumps formed in cream by homogenization were destroyed by freezing, while the heat stability destroyed by homogenization was restored by freezing. There were no detrimental effects to the body or flavor of pasteurized fresh whole milk that was condensed to one-third its weight, canned, and frozen. This milk when held frozen at a low temperature and reconstituted within a 4-week period by the addition of cold water gave a product that often could not be distinguished from fresh market milk.

For the preparation of normal undenatured casein and milk serum, frozen homogenized cream was thawed at a temperature below the melting point of the fat. Clear milk serum was collected from the melting mass and the residual mass of fat and casein used in preparing normal casein or to raise the protein solids of ice cream mix.

Oxidized flavor in milk.—I, The probable relation of lecithin to oxidized flavor, L. M. THURSTON, W. C. BROWN, and R. B. DUSTMAN (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 301–306*).—At the West Virginia Experiment Station studies indicated that lecithin, rather than butterfat, was the constituent of milk affected when oxidized flavors developed. The results also indicated that the so-called oxidized flavor was not identical with the tallowy flavor of oxidized butterfat.

The detection of formaldehyde in milk by means of the methylene blue reduction test, A. C. FAY (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 327–331*).—The Kansas Experiment Station found it possible to use the methylene blue reduction test as a basis for suspecting the presence of formaldehyde in milk. The test was not specific for the presence of formaldehyde, but short reduction times should suggest the application of more exact qualitative tests for this preservative.

The range of dilutions of formaldehyde which effectively retarded bacterial growth, definitely delayed the coagulating time, and escaped detection by the majority of tasters lay between 1:15,000 and 1:25,000. The addition of more than the lower dilution could easily be detected by the consumer, and less than the higher dilution failed to accomplish the purpose for which it was added. It is suggested that any sample of fresh milk which shows a reduction time of less than 1 hr. may be suspected of containing formaldehyde, particularly if the keeping quality or bacterial counts are contraindicative.

The composition of media for the bacteriological analysis of milk, C. S. BOWERS and G. J. HUCKER (*New York State Sta. Tech. Bul. 228 (1935), pp. 48*).—The purpose of this investigation was to study certain modifications of the

present standard agar as given in the Standard Methods of Milk Analysis of the American Public Health Association and to determine whether the substitution or addition of simple, easily obtainable ingredients would increase its growth-promoting properties. A total of 1,142 samples of milk of normal types was studied, using agar of various compositions.

Yeast extract either added to or substituted for beef extract in standard agar did not increase the number or size of the colonies in spite of the fact that this extract is desirable for the growth of certain groups of bacteria. Adding fermentable carbohydrates and 0.5 percent of skim milk to standard agar increased its efficiency, as indicated by the more numerous, larger, and more readily counted colonies. Best results in developing all the usual and unusual types of bacteria in samples of milk ordinarily examined in milk control laboratories were found with a medium made of 0.5 percent of Tryptone, 0.1 percent of glucose, 0.5 percent of fresh skim milk, and 1.5 percent of agar.

The authors feel that if proper adjustments are made in standards the adoption of a better nutrient agar will not cause hardship to the producers or dealers supplying high-grade milk. The use of the above media would make it possible to detect milk containing large numbers of bacteria more accurately.

Tests for cream sediment, E. W. Bird, D. F. Breazeale, and H. P. Guest (*Iowa Sta. Bul. 330 (1935), pp. 81–88, figs. 2*).—A method for testing cream for sediment is described. For sweet cream free from ropiness and other defects the method consists of diluting a 2-oz. sample of cream with 0.5 pt. of water at 180° F. and passing through a sediment tester. For medium sour cream 0.5 pt. of baking soda solution at 180°, made by adding 8 teaspoonfuls of baking soda to 1 gal. of water, is substituted for the water. When very sour cream is to be tested, the cream sample is diluted with 9 g of 1 percent lye solution (10 g of lye in 1 qt. of distilled or soft water) and 0.5 pt. of hot water.

The results of tests with various chemicals for the dispersions of curd are discussed. A guide is given to the amount of material that might contaminate cream from milking time until it is received at the creamery, together with precautions to be observed in performing cream sediment tests.

Art of whipping cream acquires a scientific finesse, G. F. Smith and C. A. Getz (*Milk Dealer, 24 (1935), No. 9, pp. 36, 37, figs. 2*).—In this article the authors describe a new process for the preparation of whipped cream. This process uses an all-metal container in which are introduced cream and a colorless, odorless, tasteless, and nontoxic gas such as nitrous oxide at 75-lb. pressure per square inch. By pressing a delivery button the finished product is expelled. Cream whipped by this process may reach an overrun as high as 450 percent, and fresh cream of any butterfat content from 20 to 40 percent may be used.

Cottage cheese and other popular varieties, R. M. Washburn (*Milwaukee, Wis.: Olsen Pub. Co., 1934, pp. 150+[2], figs. 7*).—The author presents in as simple a way as possible the essential steps in the manufacture of cottage and other popular varieties of cheeses. Suggestions are given for the selling of cottage cheese. A section, by A. W. Washburn, is added on the use of cottage cheese, its food value, and recipes for serving.

Problems in ice cream making, compiled and edited by R. M. Washburn (*Milwaukee, Wis.: Olsen Pub. Co., 1932, pp. 121, figs. 3*).—This handbook has been prepared for experienced ice cream operators to bring up to date the information relating to ice cream manufacture.

A study of factors influencing the separation of whey in ice cream mixes containing vegetable stabilizers, I. A. Gould and P. S. Lucas (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 307–315*).—The Michigan Experiment Station conducted a study on the separation of whey in ice cream mixes stabilized with vegetable

products, considering such factors as variations in the amount of stabilizer used, heating the stabilizer, different temperatures of pasteurizing the mix, heating the milk products used in the mix, varying amounts of serum solids and fats, and incomplete cooling of the mix.

From the results obtained it appeared that the principal factor involved in whey separation was concerned chiefly with the milk products used rather than with the stabilizer. There appeared to be a reaction or combination between the stabilizer and some natural constituent of milk, cream, and skim milk powder to bring about the separation of whey. This natural constituent of the milk products was at least partially heat labile. That the whey separation was due to enzymic action did not appear logical when it was found that heating the milk products for 1 hr. did not entirely eliminate the defect. The proteins were probably closely involved with the separation as well as certain salts.

Eliminating whey separation by any practical plant method did not appear feasible. When a stabilizer was used that caused this separation, the application of high pasteurizing temperatures appeared to be the best means of limiting the extent of separation.

Abstracts of literature on the manufacture and distribution of ice cream (*Washington, D. C.: Internatl. Assoc. Ice Cream Manfrs., 1935, vol. 6, pp. XIX+180+V+26, figs. 34*).—This is the sixth volume of this series of abstracts (E. S. R., 70, p. 526). Appended are practical facts and statistics for the ice cream manufacturer.

The heat stability of evaporated milk made from hard-curd milk, soft-curd milk, and milk from mastitis infected udders, R. C. WELCH and F. J. DOAN (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 287–294*).—Investigations at the Pennsylvania Experiment Station failed to show any appreciable difference between concentrated soft-curd milk and concentrated hard-curd milk with respect to sensitivity to heat coagulation and with respect to the stabilizing or destabilizing effects of forewarming and the addition of certain anions and cations. Concentrated milk from animals infected in one or more quarters with subclinical mastitis was less stable to heat than normal milk. This milk was further destabilized at the higher forewarming temperatures and by the additions of sodium carbonate, and was further stabilized by adding calcium acetate. Mixing mastitis milk with normal milk tended to destabilize the latter.

A study of the properties that will serve as a means to distinguish milk powders from butter powders [trans. title], H. A. SIRKS (*Dept. Econ. Zaken [Netherlands], Verslag Landbouwk. Onderzoek., No. 40 C (1934), pp. 51–66; Eng. abs., pp. 65, 66*).—A number of tests for distinguishing milk powders from butter powders were investigated at the Agricultural Experiment Station, Hoorn. All proved to be unsuccessful until it was discovered that butter powders on the average contained a much smaller number of leucocytes than milk powders. By slightly altering the existing method the number of leucocytes in the powders could be easily determined. In doubtful cases greater certainty was obtained by subjecting milk and skim milk from the factory where the powders were made to the same examination.

Effect of various phases in the manufacture of casein by the natural sour method on its physical and chemical properties, D. R. THEOPHILUS, H. C. HANSEN, R. S. SNYDER, R. E. WOOD, and R. L. OLMSTEAD (*Idaho Sta. Bul. 212 (1935), pp. 10*).—The results obtained from the analyses of 220 lots of casein made by the natural sour curd method under controlled conditions showed that with the standard method used a uniform, high-quality casein could be produced.

It was possible to control color, odor, solubility, yield, and nitrogen content within narrow limits. Viscosity, ash, pH, and conductivity were not so easily

controlled, while moisture and fat contents were extremely variable. Of the chemical and physical properties studied, total and free acidity were of little value because of the difficulty of determining the exact end point.

Either increasing or decreasing the acidity of milk from 0.64 percent at coagulating time lowered the color and odor score of the casein. A fat content of the skim milk of 0.1 percent or more and insufficient pressure on the green curd adversely affected color and odor. Thoroughness of washing and acidity at coagulating time were the most important factors in determining rate of solubility. Both a setting and a cooking temperature above 104° and 120° F., respectively, decreased solubility. A high fat content of the original skim milk and excessive moisture in the curd after pressing increased solubility. The viscosity of the finished casein increased as the temperature at any step during manufacture increased. Increasing the acidity of the original skim milk, the number of washings, and the moisture in the green curd increased viscosity. Yield of casein was determined by a completeness of precipitation, loss of curd in draining and washing, loss of impurities by washing and pressing, and loss of moisture in drying. Lower yields were accompanied by higher purity and better keeping qualities of the finished product. Moisture content of the casein depended entirely upon the drying process. Low ash content depended upon the use of acidity of 0.64 percent in the skim milk at coagulating time in order to obtain complete precipitation, thorough washing, and cooking temperatures not over 120°. The fat content of the original skim milk was the most important factor contributing to a high fat content of the casein. Higher cooking temperatures and more thorough washing with water at higher temperatures tended to reduce the fat content, but these procedures caused a tough curd. The number and thoroughness of washings and the fat content of the original skim milk were the most important factors affecting nitrogen content of casein. When the nitrogen content, calculated on the moisture-free basis, was below 14 percent, the quality of the casein was doubtful. Thorough washing of the curd was the most important factor in producing low acid casein. Any process which lowered the ash content increased the resistance in ohms, the measure for conductivity.

The variations in manufacturing process that had the greatest effect on quality were the thoroughness of washing, acidity at time of coagulation, and setting and cooking temperatures. Color, odor, solubility, viscosity, nitrogen, pH, and conductivity determinations appeared to be the best indexes of quality. The results also showed that by varying different steps in the manufacturing process casein could be made to meet any definite specifications.

Twenty-second and twenty-third annual reports of the International Association of Dairy and Milk Inspectors, compiled by P. B. Brooks (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpts., 22 (1933), pp. 307, pl. 1, figs. 2; 23 (1934), pp. 289, figs. 11*).—These are the usual reports (E. S. R., 69, p. 708) of the annual meeting held at Indianapolis, Ind., October 12–14, 1933, and at Boston, Mass., October 11–13, 1934.

Of these, the first includes the following papers: The Quality of Milk Pasteurized by High-temperature, Short-time, and 30 Minute Holding Methods, by M. W. Yale (pp. 62–64, 66, 68, 69); Chlorine Sterilizers in Dairies (pp. 70–80) and Effect of the Udder on Quality of Milk (pp. 81–84), both by M. J. Prucha; Streptococci in Milk, by W. D. Frost and M. A. Engelbrecht (pp. 85–92, 94–104); Some Observations on Cleaning Dairy Equipment, by J. W. Yates (pp. 105–107); Mechanical Refrigeration, by E. H. Parfitt (pp. 108–112, 114–119); Report of the Committee on Communicable Diseases Affecting Man, by J. G. Hardenbergh (pp. 120–122, 124–128, 130–133); Heat Resistant Bacteria in Milk, by W. D. Dotterrer (pp. 134–136, 138–141); Microscopic and Plate Counts on Thermophilic Bacteria in Pasteurized Milk, by A. R. Ward, F. O. Adams, and C. T. McCutcheon

(pp. 142–146, 148–160); Report of Committee on Milk Plant Practice, by H. A. Harding (pp. 161–172); Effective Milk Control, by H. C. Becker (pp. 173–178, 180–182, 184–186); Report of Committee on Dairy and Milk Plant Equipment, by W. D. Tiedeman (pp. 187–190); Milk Price Control in New York State, by K. F. Fee (pp. 191–196, 198–203); Report of Committee on Sanitary Control of Ice Cream, by R. E. Irwin (pp. 204–206, 208–211); Report of Committee on Ordinances, by W. B. Palmer (pp. 212–224); An Extensive Test of Variations in Bacteria Counts on Identical Milk Samples, by W. D. Tiedeman (pp. 225–236); Report of Committee on Dairy Farm Methods, by T. J. Strauch (pp. 296, 297); Report of Committee on Methods of Improving Milk Supplies in Small Communities, by C. A. Abele (pp. 298–305); and Report of Committee on Laboratory Methods, by G. E. Bolling (pp. 306, 307).

The second report includes the following papers: Laboratory Control Methods for Country Plants, by F. E. A. Smith (pp. 13–16, 18–22); Report of Committee on Dairy and Milk Plant Equipment, by W. D. Tiedeman et al. (pp. 23–32); The Detection and Control of Mastitis, by D. H. Udall (pp. 35–37, 39–50); Abortion Disease and Undulant Fever, by R. R. Birch (pp. 51–53, 55–57, 59–67); Report of Committee on Communicable Diseases Affecting Man, by J. G. Hardenbergh et al. (pp. 69–80); Official Control of Pasteurization in Massachusetts, by H. C. Lythgoe (pp. 81–92); A Practical Test of Pasteurization, by H. W. Leahy (pp. 93, 95–99, 101–108); Pasteurization and the Courts, by J. A. Tobey (pp. 109–113, 115–119); Certified Milk—Pasteurized, by R. S. Eustis (pp. 121, 122, 124–129); Report of Committee on Laboratory Methods, by G. E. Bolling et al. (pp. 131–137); The Value of Vitamin D Milks to the Consumer, by J. W. M. Bunker and R. S. Harris (pp. 139–151, 153–163); Milk Sanitation in European Countries, by R. S. Breed (pp. 164–173); Report of Committee on Interstate Shipment of Cream, by H. N. Parker et al. (pp. 174–180, 182–191); The Composition of Media for the Bacteriological Analysis of Milk, by C. S. Bowers and G. J. Hucker (pp. 219–231); Report of Committee on Dairy Farm Methods, by E. Kelly et al. (pp. 232–234, 236, 237); Report of Committee on Milk Plant Practice, by H. A. Harding et al. (pp. 239–247); Report of Committee on Food Value of Milk and Milk Products, by I. V. Hiscock (pp. 249–263); and Report of Committee on Methods of Improving Milk Supplies in Small Communities, by C. A. Abele et al. (pp. 265–276).

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[Work in animal pathology by the Kentucky Station] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 19, 20, 38, 42, 43, 44, 45, 46*).—The work of the year referred to (E. S. R., 72, p. 102) includes feeding experiments with rats to determine the limit of toxicity and the lethal doses of lead arsenate and arsenic trioxide, respectively, a study of *Salmonella anatum*, hemolytic streptococci of fowls, nematode parasites of horses, the occurrence of sheep diseases and parasites, agglutination tests for Bang's disease, and tests for mastitis made of milk drawn aseptically.

[Contributions on epizootic diseases] (*Off. Internatl. Épizoot. Bul., 10 (1935), No. 1, pp. 1–351, pls. 4, figs. 16*).—Contributions presented at the Ninth Conference of the International Office of Epizootics, held at Paris in January 1934 (E. S. R., 72, p. 102), are included, the translated titles of which are as follows: The Sanitary Situation in 1934, by E. Leclainche (pp. 1–15); A Study of Vaccines for Hog Cholera in Japan and the Results of Application and Practice, by H. Futamura (pp. 16–52); The Actual Possibilities of Rabies Prophylaxis, by C. Glaese and Zunker (pp. 53–66); The Prophylaxis of Rabies in Morocco, by Eyraud (pp. 67–86); The Infectious Anemias of Domestic Animals, by H. Carré and J. Verge (pp. 87–150); The Infectious Anemias and Particularly Infectious

Anemia of Horses, by W. Zwick (pp. 151–198); Aujeszky's Disease, by L. F. D. E. Lourens (pp. 199–240); Aujeszky's Disease, by J. Köves (pp. 241–272); Production of Tuberculin in a Synthetic Medium, by R. E. Glover (pp. 273–302); Strict Regulation of Frontier Traffic, by G. Pavlow (pp. 303–316); The Veterinary Organization in U. S. S. R., by I. V. Guinsbourg (pp. 317–331); A Medullary Paralysis of Equines of Enzootic Type in Spain, by C. R. Martinez (pp. 333, 334); Ocular Fowl Cholera (p. 335) and The Avitaminoses A and B in Birds (p. 336), both by C. Lopez and A. Steiner; Experimental Immunoprophylaxis of Rabies in Yugoslavia—Preliminary Note, by J. Jezic and E. Kodrnja (pp. 337–340); Hog Cholera in Yugoslavia (p. 341); Infectious Anemias in Yugoslavia (p. 341); Rabies in Germany (pp. 342–344), in Lithuania (p. 345), in Czechoslovakia (p. 346), and in Yugoslavia (p. 347) in 1934; and Notes on the Standardization of Tuberculin (pp. 348–351).

Report of the veterinary department for the year 1934, J. de Meza (*Nyasaland Vet. Dept. Rpt., 1934, pp. 8*).—This report includes a brief reference to the occurrence of infectious diseases of livestock in Nyasaland.

Annual report [of the] veterinary division, 1933, C. R. Turbet (*Fiji Dept. Agr. Ann. Bul., 1933, pp. 27–36*).—Part 2 (pp. 30–32) of this report deals briefly with the occurrence of and control work with the diseases and parasites of livestock, particularly with tuberculosis.

Mexican whorled or narrow-leaf milkweed (Asclepias mexicana Cav.), W. S. Ball and W. W. Robbins (*Calif. Dept. Agr. Mo. Bul., 24 (1935), No. 4–6, pp. 219, 220, pl. 1*).—A brief account of *A. mexicana*, a quite common source of loss of sheep in California, although horses and cattle are seldom poisoned.

A study of the palatability and possible toxicity of 11 species of Crotalaria, especially of C. spectabilis Roth, R. B. Becker, W. M. Neal, P. T. D. Arnold, and A. L. Shealy (*Jour. Agr. Res. [U. S.], 50 (1935), No. 11, pp. 911–922, figs. 7*).—The Florida Experiment Station conducted a study to compare by means of grazing and feeding tests the relative palatability of the green forages, the artificially dried hays, and the silages made from several species of the genus *Crotalaria*.

The grazing and feeding trials indicated that at least 8 out of 10 introduced species of *Crotalaria* were probably not toxic to cattle. *C. retusa* was not grazed, but *C. spectabilis* was definitely toxic to cattle. The results of the silage tests have been previously noted (E. S. R., 70, p. 513).

One acute and three chronic cases of *C. spectabilis* poisoning in cattle are discussed, together with the symptoms and lesions noted. *C. spectabilis* Roth was added to the list of species of this genus that are definitely toxic to domestic animals.

Additional observations on the toxicity of Crotalaria spectabilis (Roth) for swine, M. W. Emmel, D. A. Sanders, and W. W. Henley (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 175, 176*).—Observations at the Florida Experiment Station indicate that "swine under field conditions are more likely to be poisoned by the green foliage of *C. spectabilis* than by the seeds of this plant. It also appears that swine will eat the green plant much more readily when there is not an abundance of other green feeds. *C. spectabilis* being of such a thrifty nature remains green until frost and long after other green feeds have died by the heat and dryness of late summer, and it is under these conditions that many animals eat this plant."

Effect of gossypol upon the muscle of the small intestine of the rat, L. A. Moore (*Jour. Agr. Res. [U. S.], 50 (1935), No. 11, pp. 899–909, figs. 5*).—An investigation was undertaken at the Michigan Experiment Station to determine the effect of gossypol upon the isolated longitudinal muscle of the small intestine of the rat.

Kymograph records made on isolated strips of muscle showed that gossypol fed at 0.3 to 0.4 percent levels for 5 to 21 days caused a stimulation of the longitudinal muscle in segments taken from 12 to 25 cm below the pylorus. When fed at 0.2 to 0.8 percent levels for periods greater than 3 weeks and up to 8 weeks a partial paralysis resulted in segments of muscle from the same location. In a limited number of rats in a state of chronic injury segments taken from 3 to 5 cm above the cecum were not markedly affected. Gossypol fed at levels that permitted little growth usually caused a dilation in the upper portion of the small intestine.

Studies in experimental trembles or milk-sickness, J. T. CUTLER (*Jour. Tenn. Acad. Sci., 9 (1934), No. 1, pp. 1–7*).—The author's studies have led to the conclusion that (1) an accumulation of guanidine is a complicating factor in acute white snakeroot or richweed poisoning (*Eupatorium urticaefolium*) known as human trembles, (2) this accumulation must contribute materially to the production of the severe symptoms of the intoxication and be responsible, in a large measure, for the low blood sugars found in this condition, and (3) calcium medication should prove a valuable supplement to the treatment of trembles (and probably also milk sickness) by alleviating the symptoms which are caused or aggravated by guanidine.

Selenium and other toxic minerals in soils and vegetation, O. A. BEATH, H. F. EPPSON, and C. S. GILBERT (*Wyoming Sta. Bul. 206 (1935), pp. 56, figs. 15*).—Following an introduction with accounts of acute and semiacute and chronic poisoning and a review of preliminary investigations, and Cretaceous shales, the authors describe the methods of analysis employed and deal with selenium absorption, selenium in vegetation, alkali water, the most destructive poisonous plant group (*Astragalus*), other toxic minerals (including molybdenum and tellurium), critical poison areas, locoism in Wyoming, dermatitis in cattle, selenium concentrations in concretions from the Cretaceous and Eocene formations, selenium accumulation in subsoils, Morrison shale, and corrective measures. Tables are given which show the additional selenium obtained by nitric acid treatment, the selenium content of plants on raw shales, the representative native range plants occurring widely distributed in their respective habitats in Wyoming that have been found to be positive carriers of selenium when collected on Cretaceous and Eocene shales, and a partial list of native plants found not to contain selenium when growing on selenium-bearing soils from which they might be expected to absorb it. A list is given of 16 references to the literature.

"Primarily selenium presents its greatest danger in the grazing areas of the State. Control measures will never be found by methods aimed at soil detoxification. There are too many acres involved. Progress has been made by destroying plants on desirable ranges, by revegetating with forages adapted to the soils and climate which are not selenium absorbers, by preventing overgrazing, and by grazing the kind of livestock best adapted to a particular range. Further progress can be expected if the above program is continued and enlarged."

Methylene blue and other agents as antidotes in hydrocyanic acid and carbon monoxide poisoning, G. F. COOPER (*U. S. Naval Med. Bul., 33 (1935), No. 3, pp. 364–370*).—It is concluded, in view of the fact that the antagonistic action of methylene blue has been demonstrated by many research workers, that it should be tried in every case of cyanide poisoning where available. It is pointed out that amyl nitrite and sodium tetrathionate may be used also, either alone or in the case of the nitrite in conjunction with the dye. They may be of

value in carbon monoxide intoxication. The preponderance of evidence is against the value of methylene blue in carbon monoxide intoxication, and the fact that both the monoxide and the dye unite with the hemoglobin in the blood to form methemoglobin suggests the oxygen-carbon dioxide mixture (oxygen 95, carbon dioxide 5) with prolonged artificial respiration as the treatment of choice.

Notes from the publications of 1934 of interest in veterinary parasitology (*Vet. Rec., 15 (1935), No. 26, pp. 743–746, 747*).—This review of recent findings is presented with a list of 45 references to the literature.

Applied biology in the control of the worm diseases of domestic animals, E. L. TAYLOR (*Ann. Appl. Biol., 22 (1935), No. 1, pp. 168–175*).—An extended discussion of the common parasites of livestock, their economic importance, pathogenic effect, means of control, influence of dry weather on free-living stage, etc.

Studies on the nature of immunity to intestinal helminths—I, The local nature of the immunity of white rats to Nippostrongylus infection, A. C. CHANDLER (*Amer. Jour. Hyg., 22 (1935), No. 1, pp. 157–168*).—The results of four experiments conducted with the injection of immune serum, involving 195 rats, indicate that no passive immunity to *N. muris* infection is conferred on white rats, and that the course of the infection is not influenced at all. The prepatent period, number of worms established, egg output, rate of inhibition of egg production, and rate of loss of worms remain unaltered.

Infectious diseases transmitted by eggs to man [trans. title], J. VERGE (*Rec. Méd. Vét., 110 (1934), No. 12, pp. 705–723; abs. in North Amer. Vet., 16 (1935), No. 3, pp. 28, 29–31; Vet. Rec., 15 (1935), No. 28, p. 804*).—The literature relating to the transmission of the organisms of avian tuberculosis, the *Salmonella* group, and others is reviewed in connection with 106 references.

Antibody production by the rabbit against an ectoparasite, J. T. CULBERTSON (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1239, 1240*).—The author's observations indicate that infestation by the scab mite gives rise to a specific antibody in the blood of the infested rabbit.

Hypersensitivity in rabbits immune to the protein of bot-fly larvae, D. F. HOLTMAN (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 171–174*).—The author found rabbits immunized with equine botfly larvae protein to react to the cutaneous test, the reaction being of the "hypersensitiveness to infection" type. It is thought that the cutaneous test may have a practical diagnostic significance. Precipitins were found to be demonstrable in the blood serum of rabbits immunized with botfly larvae antigen, but they disappear very rapidly. The precipitin or cutaneous reactions are specific.

Experimental propagation of Strongyloides in culture, T. D. BEACH (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1484–1486*).—By planting a known number of nematode parasite (*S. simiae*) eggs from the stool of *Cebus capucinus imitator* which harbored the female parasites, on a culture medium consisting of a nutrient agar 2 g, filtered aqueous extract of monkey feces 25 cc, and distilled water 75 cc, the author found it possible to observe the entire developmental cycle of larvae and adults and their descendants. It is pointed out that as far as known this is the first demonstration of continued propagation of the free-living phase of any species of *Strongyloides*.

The biology of bacteria: An introduction to general microbiology, A. T. HENRICI (*Boston and London: D. C. Heath & Co., 1934, pp. X+472, pl. 1, figs. 178*).—This introduction to general microbiology is presented in 29 chapters.

A study of the corynebacteria associated with diseases of domestic animals, I. A. MERCHANT (*Jour. Bact., 30 (1935), No. 1, pp. 95–116, pl. 1*).—A study

made of the morphological, cultural, tinctorial, and serological characteristics of four distinct species of corynebacteria associated with diseases of domestic animals, namely, *Corynebacterium pyogenes* (Glage) Eberson, *C. pseudotuberculosis* (Preisz) Eberson, *C. renale* (Enderlen) Ernst, and *C. equi* Magnusson, is reported upon. A list is given of 82 references to the literature.

Classification of the ultravirus infections of animals [trans. title], J. VERGE and P. GORET (*Rev. Gén. Méd. Vét., 44 (1935), No. 521, pp. 261–265*).—The authors present a systematic classification of these infections.

The serological differentiation of hemolytic streptococci of human and animal origin, P. R. EDWARDS (*Kentucky Sta. Bul. 356 (1935), pp. 18*).—In the introduction to this bulletin the author points with particular emphasis to the fact that the present discussion (E. S. R., 70, p. 243) deals only with the streptococci which produce a low acidity in glucose broth, which do not hydrolyze sodium hippurate, and which produce an active hemolysin in fluid mediums. This excludes the great group of streptococci commonly found in the udders of cows, in market milk, and in cheese. The discussion is also limited to those organisms which belong to serological groups A and C of Lancefield (E. S. R., 69, p. 581). The details of the work are presented in four full pages of tabulated matter.

It has been found that the hemolytic streptococci of human and animal origin can be differentiated by precipitin tests in which acid extracts of the organisms are used as antigens. "The results of the precipitin tests are in agreement with the conclusions previously reached by biochemical methods. The differentiation of streptococci by the methods previously recommended is thereby strengthened.

"*Streptococcus equi* and [fermentation reaction] types A and B animal streptococci all fall into the same serological group by the tests used. At the present time these organisms can be differentiated only by biochemical methods. The type A animal streptococci are probably purely animal parasites. These organisms have not been found in human disease. Four strains isolated from human sources were found to be members of the type B animal streptococci. Three of these cultures were isolated from apparently normal throats of consumers of raw milk. No definite statement concerning the role of the type B strains in the production of human disease can be made at present.

"Seven strains said to have been isolated from animals were found to be members of the human type. Four of these were isolated from the udders of cows to which epidemics of septic sore throat had been traced. The remaining three cultures were said to be derived from the respiratory tract of chicks. These cultures possessed characteristics at variance with the original description of the cultures from chicks."

The results obtained in a study of 183 cultures of animal and 120 of human origin are tabulated as follows:

Biochemical reactions of streptococci

Source	Number of cultures	Lactose	Sorbitol	Trehalose	Reduction of methylene blue
Animal:					
S. equi	17	−	−	−	−
Type A	159	+	+	−	−
Type B	7	±	−	+	+
Human	120	±	−	+	{114− 6+

The influence of solar irradiation on the susceptibility of mice to an infection with S. enteritidis, I. J. Kligler and L. Olitzki (*Amer. Jour. Hyg.*, *22* (*1935*), *No. 1, pp. 1–10*).—The authors report experiments "on the effect of direct solar irradiation on the resistance of mice to a per os or intravenous infection with *S*[*almonella*] *enteritidis*. The results indicate that under the conditions of the experiments solar irradiation had no appreciable effect on the course of the per os infection, but effected a decrease in the resistance of the exposed animals, kept at a high temperature, to the intravenous infection. In the latter experiments, the fatality among irradiated animals kept at high temperature was twice as high as that among the unexposed controls, and the percentage of completely recovered animals (sterile) was 100 percent higher in the unexposed than in the irradiated groups. No constant differences were noted between mice irradiated through vita- and those irradiated through plain glass. Among the animals kept at 20° C. no significant differences were noted between the irradiated and nonirradiated groups. It appears that the unfavorable effect produced by radiation was due to overheating rather than to radiation per se."

New heat-stable agglutinogens in the suipestifer group, P. Levine and A. W. Frisch (*Soc. Expt. Biol. and Med. Proc.*, *32* (*1935*), *No. 6, pp. 883–886*).—The authors report the existence of differences in the *Salmonella suipestifer* group, first detected by characteristic phage absorption effects and confirmed by subsequent immunization and experiments on agglutinin absorption.

A method for preserving Brucella abortus for use in the preparation of agglutination antigen, C. R. Donham and C. P. Fitch (*Jour. Amer. Vet. Med. Assoc.*, *87* (*1935*), *No. 2, pp. 188–190*).—Studies by the authors at the Minnesota Experiment Station (E. S. R., 72, p. 532) have shown that plate-method antigen preparations cannot be depended upon to retain their sensitivity longer than about 6 mo. under good average conditions. They have found that this can be overcome satisfactorily by storing the bacteria in a dry condition until they are needed for use in the finished product. It is pointed out that the technic here described provides a very accurate method of fixing the bacterial concentration of test fluid, as well as solving the problem of keeping the bacteria over considerable periods of time.

The French strain of virus of Aujeszky's disease [trans. title], P. Remlinger and J. Bailly (*Bul. Acad. Vét. France*, *8* (*1935*), *No. 3, pp. 178–181*).—The authors' observations have shown the French virus of pseudorabies in France and North Africa to be the typical virus of Aujeszky's disease and to be the same as the virus from Hungary and from America. It is pointed out that in all countries reported, the clinical symptoms of the disease as observed in cattle, horses, sheep, goats, swine, the dog, and the cat are strikingly similar

Effect of splenectomy on Bacterium enteritidis infection in white mice, J. Marmorston (*Soc. Exp. Biol. and Med. Proc.*, *32* (*1935*), *No. 6, pp. 981–985, figs. 2*).—The author has found that "in a strain of mice highly resistant to bacterial infection the removal of the spleen depresses the natural resistance to a subsequently induced infection with *B. enteritidis*. In a strain of mice highly susceptible to bacterial infection the removal of the spleen does not affect the natural resistance to a subsequently induced infection with *B. enteritidis*."

Serial transmission of virus of infectious papillomatosis in domestic rabbits, R. E. Shope (*Soc. Expt. Biol. and Med. Proc.*, *32* (*1935*), *No. 6, pp. 830–832*).—The successful transmission of the virus of infectious papillomatosis serially in domestic rabbits is recorded in this preliminary report.

Cultivation of the Johne's bacillus in a synthetic medium, J. McCarter and E. G. Hastings (*Soc. Exp. Biol. and Med. Proc.*, *32* (*1935*), *No. 5, pp. 741–

745).—In work at the Wisconsin Experiment Station, the authors have found that under certain conditions the bacillus of Johne's disease (*Mycobacterium paratuberculosis*) can be induced to grow in Dorset's synthetic medium (E. S. R., 65, p. 773) without the addition of any material of unknown composition such as the cells of the timothy grass bacillus (*M. phlei*). The authors have successfully carried one of their strains of the Johne's bacillus through 10 subcultures on the synthetic medium during the last 2 yr. This has enabled them to prepare a solution of the Johne's bacillus protein for diagnostic purposes according to the ultrafiltration method of F. B. Seibert[4] for preparing tuberculin. This johnin contains none of the foreign proteins that are introduced by the use of the *M. phlei* medium, and is practically free of the crystalloids of the culture medium. It can be easily standardized by measuring the amount of protein precipitated from a sample of the solution by trichloroacetic acid. The work led to the conclusion that the dead cells of *M. phlei* contain an accessory rather than an essential growth substance for the Johne's bacillus.

Psittacosis in the developing egg, F. M. Burnet and P. M. Rountree (*Jour. Path. and Bact., 40 (1935), No. 3, pp. 471–481, pls. 2, figs. 4*).—The authors have found the psittacosis virus from Australian parrots to be readily propagated in the developing egg. Large amounts of virus develop by infection of cells of the ectodermal epithelium and a characteristic lesion develops. No infection of the embryo proper takes place, and the membrane lesions are as a rule rapidly resolved after the third or fourth day.

Epidemiological studies on relapsing fever in California, H. L. Wynns and M. D. Beck (*Amer. Jour. Pub. Health, 25 (1935), No. 3, pp. 270–276, figs. 2*).—Sixty-six of the 69 cases of relapsing fever reported in California since 1921 are said to have been from four foci, 2 of the remaining 3 having been from an unknown source and the third a laboratory infection. The four foci were all mountainous districts over 5,000 ft. in elevation and popular as summer resorts. The same wild rodents, namely, chipmunks and tamarack squirrels, have been found to harbor spirochetes resembling *Treponema recurrentis* in three of these foci, and they probably serve as the reservoirs of infection.

A new tick vector of relapsing fever in California, C. M. Wheeler, W. B. Herms, and K. F. Meyer (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 8, pp. 1290–1292*).—The name *Ornithodorus hermsi* is proposed for a new species of tick which differs from the other four forms known to occur in the State, namely, *O. turicata*, *O. talaje*, *O. coriaceus*, and *O. megnini*. This new form has been found infesting cottages at Brockway, Lake Tahoe, Calif., at an elevation of 6,000 ft., and at Big Bear Lake in San Bernardino County, at an elevation of 6,700 ft. In both cottages relapsing fever had occurred.

Infection with Trypanosoma equiperdum, D. Perla (*Arch. Path., 19 (1935), No. 4, pp. 505–523, figs. 3*).—In the experimental work with *T. equiperdum* the author has found the duration of its infection in rats to vary with the number of trypanosomes injected. "The duration of the disease varies from 3 days if overwhelming numbers of trypanosomes are injected to a period of from 10 to 19 days if 2,000 trypanosomes are injected. With the injection of fewer trypanosomes many rats of the stock used in this study escape infection."

The course of a trypanosome infection in irradiated rats, I. J. Kligler and R. Comaroff (*Amer. Jour. Hyg., 22 (1935), No. 1, pp. 11–17*).—Rats that were kept under different conditions of light and temperature and exposed daily for short intervals to direct solar irradiation were found to show no change in their resistance to a trypanosome infection (*Trypanosoma evansi*) in comparison with nonirradiated controls kept under the same conditions.

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[4] Jour. Biol. Chem., 78 (1928), No. 2, pp. 345–362, figs. 3.

The treatment of pulmonary tuberculosis by hyperpyrexia.—III, Temperatures that inhibit growth of cultures of mammalian and avian tubercle bacilli and one strain of leprae bacillus (a method of typing suggested), G. R. Duncan and E. S. Mariette (*Amer. Rev. Tuberc., 31 (1935), No. 6, pp. 687-697, figs. 3*).—Studies which have led the authors to suggest a new and shorter method of typing are summarized as follows:

"All five strains of human tubercle bacillus grew luxuriantly from 96° to 100° F., inclusive; poorly from 102° to 104°, inclusive; and not at all above this temperature. All five strains of bovine tubercle bacillus grew luxuriantly from 96° to 104°, inclusive; poorly from 106° to 108°, inclusive; and in only 1 tube out of 15 at 110°. The two strains of avian tubercle bacillus grew luxuriantly from 96° to 108° and poorly at 110°. *M[ycobacterium] leprae* (strain 1629, Mulford) grew luxuriantly from 96° to 110°. Two human strains, incubated for 8 weeks at 106° and 108°, were still able to produce progressive disease in guinea pigs. These strains after 8 weeks' incubation at 110° caused no tuberculosis in 44 days in guinea pigs.

"The temperature range at which cultures of various types of tubercle bacillus grow luxuriantly closely corresponds to the temperature range of domestic animals in which these organisms produce progressive disease. The temperature range at which cultures of various types of tubercle bacillus grow poorly closely corresponds to the temperature range of domestic animals in which these organisms produce nonprogressive chronic disease. The temperature range at which cultures of various types of tubercle bacillus do not grow includes generally the temperature range of domestic animals in which these organisms do not produce disease."

Occurrence in southwestern France of bovine anaplasmosis of indigenous origin [trans. title], J. Cuillé, Chelle, and Berlureau (*Compt. Rend. Acad. Sci. [Paris], 200 (1935), No. 23, pp. 1994-1996*).—The occurrence in southwestern France of a mild form of bovine anaplasmosis of indigenous origin is recorded.

The development of nutritional anemia in dairy calves, C. E. Knoop, W. E. Krauss, and R. G. Washburn (*Jour. Dairy Sci., 18 (1935), No. 5, pp. 337-347, figs. 2*).—In experiments conducted at the Ohio Experiment Station Holstein male calves developed nutritional anemia when fed whole milk exclusively. The daily addition of 400 mg or more of inorganic iron and 40 mg or more of inorganic copper to an exclusive whole milk diet prevents the development of nutritional anemia in calves.

A list is given of 23 references to the literature.

Bang's disease infection transmitted to a dairy herd by horses, G. C. White and P. P. Swett (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 146-150*).—Contributing from the [Connecticut] Storrs Experiment Station, the authors report upon work with a herd consisting of 14 head of purebred Jerseys when first tested for Bang's disease in 1928, at which time about one-third of the animals reacted positively and were eliminated. Subsequent reactors found in the herd led to the testing of 6 horses on the farm, 1 of which gave a completely positive reaction to *Brucella abortus* and 2 others were strongly suspicious. Tests with *Salmonella abortivo-equinus* antigen made simultaneously were negative. Following the detection of *B. abortus* infection in the horses, the cows were kept out of the horse barn and the horses were kept out of the cow paddocks and pastures; the cows were tested regularly at monthly or bimonthly intervals and remained constantly negative for the succeeding 11 mo.

A list is given of 17 references to the literature.

Bilharziasis in the bovine on the east coast of Sumatra [trans. title], H. Burggraaf (*Tijdschr. Diergeneesk., 62 (1935), No. 12, pp. 615-622, pl. 1,*

figs. 3; Ger., Eng., Fr. abs., pp. 621, 622).—A description is given of the parasite *Schistosoma spindale* and of the condition produced in a 1½-year-old animal that succumbed.

Contribution to the study of malignant catarrhal fever or gangrenous coryza of cattle [trans. title], P. RINJARD (*Rec. Méd. Vét., 111 (1935), Nos. 6, pp. 335–356, figs. 8; 7, pp. 391–406, figs. 2*).—Following a review of the literature, with a list of 20 references, the successful experimental transmission from natural cases of the disease is reported upon in the first paper. The second deals with the conservation and transmission of the virus.

Recovery from Johne's disease: Report of a case, W. A. HAGAN and A. ZEISSIG (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 199–206, figs. 6*).—A report of a case of Johne's disease in a well-developed heifer 9 mo. of age, which, after developing a typical and advanced form, apparently recovered completely and remained well for more than 5 yr. "The autopsy examination showed, however, that the infection had not been eliminated, and undoubtedly the animal had been discharging bacilli throughout the period. It has been our experience that, in clinical cases, well-developed lesions always are found in the lower end of the small intestine, in the cecum, and in the first part of the colon."

The effect of mastitis upon milk production, A. O. SHAW and A. L. BEAM (*Jour. Dairy Sci., 18 (1935), No. 6, pp. 353–357; also in Jersey Bul. and Dairy World, 54 (1935), No. 30, pp. 893, 894*).—The authors' studies have shown that "only a small variation exists between the pounds of milk, percent butterfat, and pounds of butterfat produced by opposite noninfected quarters of a cow's udder. A considerable variation may be found between the production of opposite mastitis infected and noninfected quarters of a cow's udder. Mastitis infection apparently reduced milk production approximately 22 percent and butterfat production 24 percent after allowing for the maximum variation found in the milk and butterfat production of noninfected quarters."

A report on the comparative treatment of piroplasmosis of cattle due to Babesia bigeminum with trypan blue and trypaflavine (gonacrine) [trans. title], C. CERNAIANU and I. RADEF (*Bul. Soc. Path. Exot., 28 (1935), No. 5, pp. 368–375*).—The authors have found trypaflavine to possess all the advantages reported by other investigators and recommend its use in all cases of this affection. It is also recommended for use in bovine babesiellíasis, due to *Babesiella bovis*, a disease also frequently met with in Rumania. The administration of trypan blue was found to be less effective.

Purification and culture of Tritrichomonas foetus (Riedmüller) from cows, R. W. GLASER and N. A. CORIA (*Amer. Jour. Hyg., 22 (1935), No. 1, pp. 221–226*).—By taking advantage of the migrating response, five strains of *T. foetus* were separated by the authors from associated micro-organisms and cultivated in the pure state. The direct use of vaginal washings from diseased cows gave the most consistent results.

Infectious necrotic hepatitis of sheep in Bessarabia due to Bacillus oedematiens: Active immunization with the aid of anacultures [trans. title], C. CERNAIANU and M. MIHAILESCU (*Compt. Rend. Soc. Biol. [Paris], 118 (1935), No. 15, pp. 1586–1588*).—Following a brief review of the literature, with a list of 11 references, the authors report upon observations in Bessarabia, where in the 44 cases of infectious necrotic hepatitis studied there was a massive infestation of the liver by the small liver fluke (*Dicrocoelium lanceatum*) and never by the large fluke (*Fasciola hepatica*). Cultures of *B. oedematiens* Weinberg and Séguin were obtained from the marrow of the long bones, the heart blood, and particularly from the liver pulp from necrotic foci when examined shortly after death. A single administration of a formolized vaccine of *B. oedematiens*

applied to 1,300 sheep in 1933 and to 2,980 sheep in 1934 in a flock in which the mortality had been very high resulted in a nearly complete arrest of mortality after 3 or 4 days.

The migration of hog cholera virus when subjected to electrophoresis, L. H. SCHWARTE (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 177–182*).—The author has found that the "serum virus of hog cholera migrates toward the positive pole at pH values from 5.0 to 9.0. The virus of hog cholera either carries a negative electric charge or is carried toward the positive pole by the associated proteins. It is not possible within the pH range studied to separate hog cholera virus from the associated proteins by the electrophoretic method employed."

The large roundworm of pigs, Ascaris lumbricoides L. 1758: Its life history in Queensland, economic importance, and control, F. H. S. ROBERTS (*Queensland Dept. Agr. and Stock, Anim. Health Sta., Yeerongpilly, Bul. 1 (1934), pp. [2]+81, pls. 12*).—Following an introduction which takes up the history of and previous work with *A. lumbricoides* in Australia (pp. 1–3), part 2 deals with its distribution and economic importance (pp. 3–6), part 3 with its preparasitic life cycle (pp. 6–27), part 4 with the parasitic life cycle (pp. 27–48), part 5 with the resistance by pigs to infestation (pp. 49–60), part 6 with the pathogenicity of *Ascaris* infestation (pp. 61–68), part 7 with the control of ascariasis (pp. 68–75), and part 8 with a summary of the subject (pp. 75–77). A 4-page list of references to the literature is included.

Transmission of equine encephalomyelitis by Aedes aegypti, C. TEN BROECK and M. H. MERRILL (*Arch. Path., 20 (1935), No. 1, p. 164*).—In further work on the transmission of this disease (E. S. R., 73, p. 107), the authors' attempts to confirm the findings of Kelser et al. (E. S. R., 69, p. 434; 70, p. 390), that the western strain of the virus may be transmitted by the yellow-fever mosquito, have shown that the mosquito must be fed a large amount of virus in order to become infective. When fed small amounts, the virus can be demonstrated immediately, but it is lost in the course of a few days. "We have also found that the western strain of encephalomyelitis virus will increase in the body of *A. aegypti*. It has been carried through a series of 15 lots of mosquitoes by feeding normal mosquitoes on the crushed bodies of infected ones, and the virus has reached a dilution far beyond that which could infect if increase had not taken place. Another fact that has come out is that while *A. aegypti* will readily transmit the western strain of virus, it rarely is able to transmit the eastern strain. We have never succeeded in getting mosquitoes fed on suspensions of the brains of guinea pigs infected with the eastern strain to transmit the virus by biting, while those fed on infected guinea pigs occasionally are able to transmit it."

Infectious meningoencephalomyelitis of the horse in the U. S. S. R. [trans. title], R. S. VICHÉLESSKY, A. NASKOV, M. SOUKHOF, and V. MOUTOVINE (*Rec. Méd. Vét., 111 (1935), No. 6, pp. 357–364*).—This filtrable virus disease of the horse, known for a long time in Russia and of which several types are recognized, from 1931 to 1934 invaded important territories in different regions. The cat, rabbit, guinea pig, rat, white mouse, and pig also have been found by experience to be susceptible. In experimental work a hyperimmune serum was produced which possessed virucidal and preventive properties for this virus and also for the rabies virus. This serum is not virucidal for the virus of Borna disease or the New Jersey and California strains of the encephalomyelitis virus. There was found to be a cross-immunity with the rabies virus but not with the virus of Borna disease and the American encephalomyelitis virus.

Treatment of equine piroplasmosis due to Babesia caballi by gonacrine [trans. title], G. Lo**e**f and J. Guilhon (*Bul. Acad. Vét. France, 8 (1935), No. 3, pp. 172–177*).—The authors' investigations have shown a remarkable therapeutic action by gonacrine, a chlorohydrate of diamino acridine, in treating piroplasmosis of the horse due to *B. caballi*.

The immunity of dogs to Ancylostoma caninum, A. O. Foster (*Amer. Jour. Hyg., 22 (1935), No. 1, pp. 65–105, figs. 7*).—In the author's experimental study of the resistance of dogs to the dog hookworm *A. caninum*, 30 dogs, representing 8 litters, were employed in 7 experiments. Of these dogs 23 were subjected to repeated infection, while 7 were retained as controls. "In 2 experiments, the previously exposed animals were clearly more resistant to test infections than were the previously uninfected controls, while in 3 other experiments the opposite condition prevailed. Although some 'immunized' animals were freed of hookworms prior to test infections, their condition of resistance did not appear to have been affected. Twelve animals died of acute hookworm disease during the course of repeated infections and, from the data presented by several of these, it was concluded that severe infestation may be a factor which predisposes to increased parasitism by hookworms."

Immunity against a cestode parasite, Cysticercus pisiformis, K. B. Kerr (*Amer. Jour. Hyg., 22 (1935), No. 1, pp. 169–182*).—In the work conducted *Taenia pisiformis* (*serrata*), which occurs in the intestine of the dog, and its larval stage (*C. pisiformis*), which develops in the rabbit, were employed. Rabbits were subjected to a series of intravenous, subcutaneous, and intraperitoneal injections of both fresh and dried worm material (*T. pisiformis*) in an attempt to immunize them against *C. pisiformis*.

"On the basis of an examination of the surfaces of the livers, 34 out of 35 rabbits which were subjected to a series of injections and which were not infected before being brought into the laboratory showed a degree of immunity. An immunity due to previous infection has been established. It has been possible to passively transfer immunity to other rabbits. When at least 2 cc per 100 g body weight of serum from infected animals were injected, the development of the larvae was completely inhibited in 4 of the 8 experimental rabbits in one experiment."

The relation of the influenza virus to the dog distemper virus of Carré [trans. title], A. T. v. d. Schaaf (*Tijdschr. Diergeneesk., 62 (1935), No. 12, pp. 635–637, 638; Ger., Eng., Fr. abs., pp. 637, 638*).—The author found that an infection of ferrets with the influenza virus, preceding an infection with the distemper virus, increases the resistance to the latter infection insofar that the disease runs a less acute course and it takes longer before the ferret dies of distemper.

Mammalian phase of the lungworm Aelurostrongylus abstrusus in the cat, M. and A. Hobmaier (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 191–198, figs. 15*).—The authors' studies of *A. abstrusus* have demonstrated that its life cycle is as follows:

"Infective larvae of the lungworm develop after two moltings in various snails and slugs. Intercalation of different auxiliary hosts is possible. Infections result from invasion of the lungs only of cats, in which the third-stage larva undergoes two moltings and attains the final characteristics of male and female adults after the fourth and fifth stages have been passed. This type of development is different from the life cycle of any other lungworm known at the present time, due to the possibility of intercalation of auxiliary hosts and due to the exclusive development of these nematodes in the lungs. This is the first description of the life history of a lungworm belonging to the large and important group of Synthetocaulinae."

Intermediate hosts of Aelurostrongylus abstrusus of the cat, M. and A. Hobmaier (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1641–1647, figs. 2*).—About 2 percent of the cats examined by the authors in California were found to be infested with the lungworm *A. abstrusus*. Different species and varieties of snails of the genus *Epiphragmophora* were found serving as principal hosts. Other snails and slugs mentioned seemed to be of minor importance. A description is given of the development of the third stage larvae, and subsequent infections of cats and kittens are recorded. Mice fed with first stage larvae of this lungworm escaped infections. It is pointed out that mice do not serve as intermediate hosts of this lungworm.

The physiology of the cecum of the domestic fowl, C. Olson, Jr., and F. C. Mann (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 151–159*).—In a study of the alimentary canal of 42 chickens the pH values of the cecum were found to be lower than those of either the preceding or succeeding portions of the intestine.

The studies on the filling of the cecum indicated that the dyes carmine, rose bengal, and trypan blue, and hydrokollog, mixed with a dry feed, could be detected in the cecum from 24 to 48 hr. after being fed. Lampblack, when mixed with the feed, did not gain entrance to the cecum in any appreciable amount even when fed for a period of 2 weeks. The ceca were found to empty themselves of carmine and rose bengal, which entered the ceca after having been ingested with the feed, 120 hr. after cessation of feeding of the dyes.

A list is given of 15 references to the literature.

A survey of the prevalent diseases of poultry, H. F. Newbigin and J. E. Wilson (*Highland and Agr. Soc. Scot. Trans., 5. ser., 47 (1935), pp. 64–93, figs. 8*).—The poultry diseases and parasites noted are fowl pox, colds, tuberculosis, fowl cholera, gapes (*Syngamus trachea*), the large roundworm (*Ascaridia galli*) and the small roundworm (*Heterakis gallinae*), the tapeworm *Davainea proglottina*, fowl paralysis, pullorum disease, and coccidiosis.

Idiopathic hypoparathyroidism and tetany in the fowl, F. B. Hutt and W. L. Boyd (*Endocrinology, 19 (1935), No. 4, pp. 398–402*).—A report contributed from the Minnesota Experiment Station of a study of a young pullet which was afflicted with tetany and paresis after laying 11 eggs and was found to have only 9.47 mg of calcium per 100 cc of blood plasma, when 20 mg would have been normal. "Liberal doses of calcium gluconate given intraperitoneally and intravenously had no effect and the paresis persisted, with tetany succeeded by coma. Treatment with parathormone (Lilly) given on the fifth day resulted in complete recovery. Blood calcium was raised, egg production was resumed, and the bird laid exceptionally well for a period of 6 mo. thereafter, maintaining 21.46 mg blood calcium 77 days after administration of parathormone.

"The case was diagnosed as one of hypocalcemia and tetany resulting from temporary idiopathic hypoparathyroidism. It is apparently the first case of tetany reported in birds. It is suggested that the rarity of hypocalcemia and tetany in birds may result from special facilities for metabolizing calcium evolved as necessary functions in the avian type of reproduction, and that the role of the parathyroid hormone in that process is to increase the nonfiltrable adsorbable calcium in the blood."

Preparation of anti-fowl-cholera serum from the bovine [trans. title], C. Kolayli, N. Mavridès, and E. Abaybani (*Rev. Gén. Méd. Vét., 44 (1935), No. 521, pp. 265, 266*).—By administration of a killed culture of *Pasteurella avicida*, followed by the subcutaneous injection of pure cultures, the authors have produced a hyperimmune serum from young bulls that is effective against fowl cholera.

Variations in the percentage of takes in 6 strains of chicken leukosis, J. Engelbreth-Holm and A. R. Meyer (*Acta Path. et Microbiol. Scand., 12 (1935), No. 3, pp. 366–377, figs. 4*).—In transmission work with material comprising about 1,000 hens and 1,500 chicks, with 5 different strains of chicken leucosis, the following results were obtained:

"(1) Inoculation of 1,252 chicks with erythroblastosis (hemocytoblastosis) gave takes in 97 percent (these animals died of the disease on an average of 12 days after the inoculation), while myeloblastosis (360 chicks) gave takes only in 35 percent (with an average lifetime of 32.5 days after the inoculation). This difference in the percentage of takes does not necessarily go against the view that the two types of disease are due to the same agent.

"(2) Several findings appear to indicate that the disease in a strain of chicken leucosis will assert itself with greater virulence when the more primitive cells are attacked by the agent.

"(3) Inoculation of 1,252 chicks gave takes in 97 percent, while inoculation of 1,036 adult chickens with the same strains (erythroblastosis) showed takes in only 70 percent. This fact is closely connected with the following:

"(4) The percentage of takes in chicks was the same throughout the year (95 to 100 percent), whereas the percentage of takes in adult chickens showed pronounced seasonal variations through 3 yr. in 3 different strains, with a maximum in April–May (ca. 82 percent takes) and a minimum in October–November (ca. 40 percent takes)."

Further studies on the agent of chicken leukosis, A. R. Meyer, J. Engelbreth-Holm, and E. Uhl (*Acta Path. et Microbiol. Scand., 12 (1935), No. 3, pp. 378–392*).—The authors have found (E. S. R., 67, p. 747) that "the leucosis agent can in vitro be bound by blood corpuscles from normal and spontaneously recovered chickens as well as by blood corpuscles from pigeons, rabbits, sheep, and man. This binding is therefore to be regarded as a process of physical adsorption.

"The immunity resulting from spontaneous recovery of chicken leucosis protects not only against leucotic material from the strain with which the animal was inoculated originally but also against leucotic material from other strains of leucosis, including our strain of combined leucosis-sarcoma. Correspondingly, naturally resistant animals are refractory to inoculation with material from pure leucosis strains and from the combined strain of leucosis-sarcoma.

"Plasma from spontaneously recovered animals is able in vitro to neutralize (inhibit) the free leucotic agent. Plasma from naturally resistant animals appears to possess this inhibitory power too. Ten normal hens were found not to possess such a property. The plasma from a chicken with slowly progressing erythroblastotic anemia was found to possess inhibition power, whereas no such property could be demonstrated in the plasma of an animal with acute leucosis.

"Attempts to transmit chicken leucosis to young ducks (3 to 6 mo. old) were not successful. The plasma from 2 normal ducks proved unable to neutralize leucotic agent. Plasma from 10 ducks which had been immunized with leucotic chicken blood was found to have a marked inhibitory power against leucotic agent. An experiment is reported which suggests that such a duck-immune serum is also able to display an inhibitory effect on cell-bound leucotic agent (leucotic blood)."

Tissue culture studies on relation of sarcoma to leukosis of chickens, J. Furth and E. L. Stubbs (*Soc. Expt. Biol. and Med. Proc., 32 (1934), No. 2, pp. 381–383*).—A description is given of a pure culture of chicken sarcoma that elaborates a highly virulent virus or viruses capable of producing both sarcoma and erythroleucosis.

Biology of the Salmonella pullorum-S. gallinarum group [trans. title]. G. PACHECO and C. RODRIGUES (*Compt. Rend. Soc. Biol. [Paris], 119 (1935), No. 23, pp. 888-890*).—In the first of two contributions (pp. 888, 889) the authors report upon hydrogen sulfide production by the group; in the second contribution (pp. 889, 890) on their sugar fermentation characteristics.

A study of variation of Salmonella pullorum, H. VAN ROEKEL (*Massachusetts Sta. Bul. 319 (1935), pp. 60, pls. 16*).—Following a review of the literature, presented with a list of 75 references, the author reports upon work conducted, the details being presented in tabular form, which has led to the following conclusions:

"Variation of characters of *S. pullorum* may be detected among freshly isolated strains, as revealed by 13 of 163 strains studied. The behavior of the recently isolated variants in sodium chloride solution of different concentrations and in the presence of positive and negative sera differed greatly. Such properties as colonial and cellular morphology, Gram-staining, and biochemical reactions revealed little or no variation in the majority of the derived variants. Many strains of *S. pullorum* readily underwent variation when subjected to frequent transfer and storage in meat infusion broth. Variants were isolated and stabilized on solid media by colony selection and by frequent transfer.

"When variants were cultivated on both meat extract agar and liver infusion agar the colonial and cellular features often appeared markedly different. Some strains that appeared typical on meat extract agar exhibited pleomorphic tendencies when placed on liver infusion agar. Variation of *S. Pullorum* was not observed when the organism was subjected to alternate transfer in liquid and solid media or cultivated in 5 percent peptone solution, in deep meat infusion broth, or in plain 3 percent meat extract solution. *S. pullorum* variants may settle out in broth cultures, the degree of settling varying with the different types. The ability to remain suspended in sodium chloride solution varies with the different variants, and it may fluctuate even within the same type. The power of the variants to attack the different fermentable substances was practically the same as that of the normal type. Passage of the variants through whole fresh eggs and through the natural host (chicks and mature fowl) had little or no influence on the general features of the different types. Most variants exhibited a lesser degree of virulence than their parent strains, and in some instances appeared avirulent.

"Repeated subcutaneous inoculations of massive doses of variants may serve as a means of detecting organisms that resemble the normal type in colonial and cellular morphology, Gram stain and biochemical reactions, and in agglutinability. A menstruum which maintained the variants in suspension and which was also satisfactory for conducting the agglutination tests was not discovered. The agglutinogenic power and the absorptive capacity of the variants tested were not equal to those of the normal type."

The rapid whole blood agglutination test for the detection of pullorum disease carriers, J. BIELY (*U. S. Egg and Poultry Mag., 41 (1935), No. 8, pp. 21-24, fig. 1*).—The value of this test is dealt with in a practical way.

A case study of subacute pullorum disease, H. C. GAUGER (*Poultry Sci., 14 (1935), No. 4, pp. 236, 252, 253*).—The author reports a case study of subacute pullorum disease in which the clinical symptoms and post-mortem findings were similar to those often found in subacute typhoid infection. The case is considered of particular interest because of the consistency with which *Salmonella pullorum* was recovered from the feces each day from April 20, 1934, the day following receipt of the fowl, to May 8, the day preceding its death.

Comparative resistance of five breeds of chickens to the nematode Ascaridia lineata (Schneider), J. E. ACKERT, L. L. EISENBRANDT, J. H. WILMOTH, B. GLADING, and I. PRATT (*Jour. Agr. Res. [U. S.], 50 (1935), No. 7, pp. 607–624, fig. 1*).—The findings in earlier studies at the Kansas Experiment Station of the resistance of White Leghorn chickens to the fowl nematode *A. lineata* (E. S. R., 64, p. 680; 67, p. 604; 72, p. 691) have led to an investigation of the comparative resistance of other breeds to this nematode.

The results, the details of which are given in tables, furnish information on the comparative resistance among breeds and varieties of one species to the same helminth for the first time. The data supporting the conclusions drawn were secured in experiments with 1,251 chickens of four breeds and two varieties of a fifth breed given the same number of eggs from *A. lineata*. The criteria for judging the resistance were the average number and length of the *A. lineata* from each group of chickens under comparison.

"Most resistant to the parasites were the heavy breeds and varieties—Rhode Island Reds, White Plymouth Rocks, and Barred Plymouth Rocks; the most susceptible were the White Leghorns, Buff Orpingtons, and White Minorcas. A strain of heavy White Minorcas proved to be more resistant to the *A. lineata* than a lighter strain of the same breed with different genetic constitution. Factors in the differences in resistance appear to include greater utilization of nervous energy by the most susceptible breed, possible differences in strains within a breed, and the normality or tolerance of the host breeds."

Action of Ascaris lumbricoides substance on the growth of fibroblasts in vitro, R. HOEPPLI (*Acta Path. et Microbiol. Scand., 12 (1935), No. 3, pp. 281–289, figs. 2*).—In the author's studies "extracts of fresh *A. lumbricoides* muscle and of female sexual organs prepared with Tyrode's solution, furthermore *Ascaris* body fluid and salt solution in which worms had lived for 4 days, influenced unfavorably, in varying degree, chicken fibroblasts (chondroblasts) in vitro. Since the pH of the various liquids used for the experiments was within the range suitable for fibroblast cultures, it could therefore not be responsible for the unfavorable action. The possibility that perhaps highly diluted *Ascaris* body fluid might stimulate the growth of fibroblasts was excluded by a series of experiments.

"The results obtained with *Ascaris* may serve as a basis and control for experiments with other helminths which are known to cause more severe lesions of the surrounding tissue. If substance of such worms will show an unfavorable action on cells in vitro, the results obtained with *Ascaris* should be considered before one regards such an action as specific."

Resistance of the oocysts of Eimeria tenella to incubator conditions, C. A. HERRICK (*Poultry Sci., 14 (1935), No. 4, pp. 246, 252*).—It was found in experiments at the Wisconsin Experiment Station that "under some practical incubator conditions the oocysts of *E. tenella* can remain infective on the shells of eggs for a period of 3 weeks. However, since none of the chicks hatching from the contaminated eggs became infected with coccidia, it would seem that not many chicks became infected while in the incubator. The possibility is there, nevertheless, and may partially explain the source of infection in some spurious outbreaks of coccidiosis in well-managed flocks of young chickens."

Records of Mallophaga and other external parasites from birds at Churchill, Manitoba, C. R. TWINN (*Canad. Ent., 67 (1935), No. 7, pp. 157–159*).—The occurrence of Mallophaga is noted, followed by a host list.

The prevalence of organisms of the paratyphoid group in duck eggs [trans. title], K. BELLER and H. REINHARD (*Berlin. Tierärztl. Wchnschr., 50 (1934), No. 13, pp. 226–228; abs. in Vet. Rec., 15 (1935), No. 28, p. 804*).—In an examination of 1,566 eggs from 34 farms scattered throughout Germany, eggs

from 19 farms were found to contain organisms of the paratyphoid group. In 11 instances (involving 3 farms) *Salmonella enteritidis* (Gaertn.) was identified, and in 7 instances (involving 4 farms) the Breslau type of *Salmonella* was recorded. Nearly 1 percent of the 1,566 eggs was infected.

A list is given of 13 references to the literature.

The efficacy of carbon tetrachloride in roundworm control, J. E. Ackert and G. L. Graham (*Poultry Sci., 14 (1935), No. 4, pp. 228–231, fig. 1*).—In work at the Kansas Experiment Station carbon tetrachloride was administered as an anthelmintic for the fowl nematode *Ascaridia lineata* (Schneid.) in five experiments involving 320 chickens. "For parasitizing, 50±5 embryonated eggs of the nematode were given to each chicken under comparison. The carbon tetrachloride was administered in gelatin capsules inserted into the esophagus and forced into the crop.

"When used at a dose rate of 10 cc per kilo of body weight on chickens 10 weeks of age all nematodes were removed, but a mortality of 25 percent of the chickens resulted. A dose rate of 4 cc per kilo was found to be 100 percent effective on young chickens and practically free from toxic effects.

"The egg production of pullets was materially reduced for a period of 7 to 10 days following the administration of carbon tetrachloride at the dose rate of 4 cc per kilo of body weight."

Will botulism become a world-wide hazard to wild fowl? E. R. Kalmbach (*Jour. Amer. Vet. Med. Assoc., 87 (1935), No. 2, pp. 183–187, figs. 2*).—In this discussion the author points out that duck sickness (botulism) of North America and of Australia, as reported by Pullar (E. S. R., 72, p. 261), is caused by closely related yet distinguishable variants of the same organism, namely, *Clostridium botulinum* type C and *C. parabotulinum* (Seddon).

AGRICULTURAL ENGINEERING

A text book of applied hydraulics, H. Addison (*New York: John Wiley & Sons, 1934, pp. XII+409, figs. [327]*).—This handbook presents a compact summary of the fundamental principles of hydraulics and of the manner in which they are applied by the engineer.

Part 1, relating to fundamental principles, contains chapters on liquids and their properties, static pressure of liquids, flow of liquids through orifices and over weirs, flow of liquids through pipes and along channels, dynamic pressure of liquids, and rotary motion of liquids. Part 2, on practical applications, contains chapters on pipes and pipe systems, control of water in open channels, some automatic control devices, hydraulic turbines—construction, hydraulic turbines—performance, pumping machinery—positive pumps, pumping machinery—centrifugal and propeller pumps, hydraulic transmission and storage of energy, and hydraulic measurements.

Surface water supply of the United States, 1933, Parts 3, 5 (*U. S. Geol. Survey, Water-Supply Papers 743 (1935), pp. IX+357, fig. 1; 745 (1935), pp. VII+220, fig. 1*).—These reports present the measurements of flow made on streams during the year ended September 30, 1933, No. 743 dealing with the Ohio River Basin and No. 745 with the Hudson Bay and Upper Mississippi River Basins.

Surface water supply of Hawaii, July 1, 1932, to June 30, 1933 (*U. S. Geol. Survey, Water-Supply Paper 755 (1935), pp. V+125*).—This report presents the results of measurements of the flow of streams and ditches in the Territory during the year ended June 30, 1933.

Conservation of water by means of storage reservoirs, diversion dams, contour dikes, and ditches, O. W. Monson (*Montana Sta. Bul. 301 (1935), pp.

pl, figs. 29).—Technical information is given on the design and construction of storage and diversion dams and diversion ditches and dikes for use in the development of flood irrigation; stock water reservoirs; selection of reservoir sites with reference to storage capacity, drainage area, suitability of soil, accessibility of structural materials, volume of earthwork, and natural spillway; and construction of earth dams, contour dikes, and contour ditches.

An appendix describes such structures as already built.

A study of the behaviour of the water table in underdrained and surface-drained river valley soils in Quebec, R. MILLINCHAMP (*Sci. Agr., 15 (1935), No. 9, pp. 625–632, figs. 6*).—This is a progress report of investigations at Macdonald College which relate to the influence of drainage on the water table in soil and in turn its influence on root development of forage and other crops.

The data are presented graphically for the four experimental plats, and in general indicate the ability of the tile drains to lower the water table. Further objectives of the study are to determine optimum depth and spacing of tile drains and the physical characteristics of the soils and subsoils of typical heavy river valley lands.

Report of cooperative drain tile laboratory, D. G. MILLER (*Minn. Dept. Conserv. Bien. Rpt., 2 (1933–34), pp. 39–48, figs. 7*).—A brief sketch of the history of the laboratory and its work is presented. The work is conducted cooperatively by the Minnesota Experiment Station and the U. S. D. A. Bureau of Agricultural Engineering.

The strength of monolithic concrete walls, F. E. RICHART and N. M. NEWMARK (*Ill. Engin. Expt. Sta. Bul. 277 (1935), pp. 36, figs. 11*).—The tests reported were made in cooperation with the Portland Cement Association for the purpose of obtaining information on the strength and stability of monolithic concrete walls of types used in concrete house construction. The investigation was of the nature of a reconnaissance of the field rather than a detailed study.

Tests were made on panels of single and double walls of various thickness, made of dry-tamped concrete, and constructed in successive courses. Tests were also made on ribbed walls consisting of a slab and vertical ribs constructed as a single unit, and on single walls of the same size and shape as the dry-tamped single walls, all made of poured concrete. Eighteen large and 6 small wall panels and 2 ribbed walls were tested with a uniformly applied axial vertical load. Two ribbed walls were tested with an eccentric load, and 7 walls were tested in flexure.

It was found that the compressive strength of all axially loaded walls varied from 1,530 to 4,380 lb. per square inch of loaded wall. The wall strength was affected to a slight extent by the type of wall, whether single, double, or ribbed, and to a very great extent by the strength of the concrete composing the wall. The compressive strength of all axially loaded walls, large and small, was over 55 percent of the strength of the concrete control cylinders and averaged about 78 percent of the cylinder strength. Only the 6-in. single walls had a strength equal to the control cylinder strength, although two 4-in. walls approached the cylinder strength very closely. None of the double walls was as strong relatively as the thickest solid walls, considering that only one of the double walls was loaded. The strongest double walls averaged about 82 to 84 percent of the cylinder strength. There was apparently some weakening effect due to the manner of placing of the ties. The double 3-in. walls were distinctly the weakest walls tested in comparison to the cylinder strengths.

From the small number of tests no definite conclusion as to the relative strength of large and small walls may be drawn. Apparently the large walls developed about the same relative strength as the small walls of the same thickness. The modulus of elasticity of the concrete in the walls was in general

about the same as has been observed previously for concrete of the same strength. The modulus varied from 2,400,000 lb. to about 6,000,000 lb. per square inch for concrete strengths of 1,780 to 5,850 lb. per square inch. The flexural strength of the dry-tamped walls was evidently dependent upon the adhesion between courses, and was least where the courses were constructed 12 hr. or more apart. Values of modulus of rupture varied from 60 to 130 lb. per square inch for these walls. The flexural strengths of the solid-poured wall and the ribbed walls were not sensibly different from beam strengths of beams of similar section when all the elements involved were evaluated. Assuming failure in flexure to take place at the maximum moments recorded in the test walls, and further assuming construction joints in the dry-tamped walls at midheight, the lateral loads that would cause failure of the walls on a 9-ft. story height are as follows: For solid 4-in. walls of dry-tamped concrete 18 lb. per square foot, for double 4-in. walls of dry-tamped concrete 72-lb., for 4-in. solid-poured walls 108 lb., and for ribbed walls about 200 lb. per square foot.

The eccentrically loaded ribbed walls were able to carry only 20 to 30 percent as great a load as the axially loaded ribbed walls. The eccentricity was very high, almost four-tenths of the total depth of the section. Heavier rib sections might very profitably be used in walls of this kind as well as special details for minimizing the eccentricity of loading.

Public Roads, [July 1935] (*U. S. Dept. Agr., Public Roads, 16 (1935), No. 5, pp. 77–96+[2], figs. 19*).—This number of this periodical contains the current status of U. S. Public Works road construction as of June 30, 1935, State motor vehicle registrations and receipts, 1934, and an article entitled Microchemical Examination of Soil Solutions, by J. A. Kelley (pp. 77–89).

Power on West Virginia farms, F. D. Cornell, Jr. (*West Virginia Sta. Bul. 267 (1935), pp. 44, figs. 16*).—The study here reported relates to the use of power on 441 West Virginia farms, on 260 of which horses furnished all of the drawbar power. Tractors were employed on 181 farms. A summary is given of the power units on both tractor and nontractor farms, which includes the number of each type of power unit, the number of farms on which each was used, and the percentage of all farms using each type of power. The average size of all farms included in the study was 254 acres.

An increasing tendency was noted on the part of tractor farmers to use horses in drawbar operations. In many instances the business was not sufficiently large a unit to warrant the purchase of a tractor.

Tractors were found to have displaced 1.18 horses per farm, and the use of tractors had considerable effect on the layout and size of the farm. Not enough colts are being raised in West Virginia to meet the demand for power replacements. The cost of keeping a horse on tractor farms was as great as on farms not using horses.

It was found that the development of the use of electricity and tractors has decidedly limited the use of stationary engines on farms.

Electrical power usage in Vermont cooperative creameries, O. M. Camburn (*Vermont Sta. Bul. 388 (1935), pp. 8*).—Studies of the consumption of electricity by dairy machinery, conducted in five cooperative creameries, are reported. It was found that the cost of electricity amounted to 3.5 percent of the total cost of operation, with rates ranging from 1.83 to 4.06 ct. per kilowatt-hour. The kilowatt-hour usage at the several plants by 14 different types of mechanism, including lighting equipment, is presented and discussed.

More tractors on U. S. farms (*Impl. and Tractor, 50 (1935), No. 15, p. 11, fig. 1*).—Data secured by the Farm Equipment Institute are reported indicating that there has been a steady increase in the number of tractors on farms in the United States during the past 10 yr., even during the depression years.

The institute estimates that there were 1,123,251 tractors on farms on January 1, 1935, as compared with 920,032 on January 1, 1930. It also estimates that this number has been increased to 1,174,889 as of July 1, 1935.

A drawbar dynamometer and its use in soil tillage experiments, G. W. Giles (*Missouri Sta. Res. Bul. 226 (1935), pp. 19, figs. 14*).—This bulletin describes a drawbar dynamometer designed and built for use in soil tillage experiments. The dynamometer consists of three major parts, namely, (1) the hydraulic units, (2) pressure recording instrument, and (3) oil transmission line.

This dynamometer was found to be easily and quickly adapted to any farm implement. Soil-resistance maps were made with the dynamometer for two ranges planted to corn for the 1934 season. It was found that for accurate maps of small areas it is necessary to secure very accurate depth measurements and correct the draft values accordingly. A common moldboard plow was found best suited to determine soil resistance, since it exerts a force over the entire cross-sectional area of the surface and the amount of cut can be kept more constant than with other types of tillage implements.

Rural community building plans, D. G. Carter (*Arkansas Sta. Bul. 322 (1935), pp. 30, figs. 16*).—Typical plans developed by the station in a cooperative study with the Federal Emergency Relief Administration relating to the development of designs for community buildings are presented, together with data on costs, materials, and plan requirements.

The classification of community buildings discussed in this bulletin is (1) food processing buildings, (2) marketing structures, (3) camp and recreation buildings, (4) community meeting places, and (5) rural work centers.

The principal food processing building is the canning center, which may be modified to include storage space, refrigeration, and slaughtering equipment. The chief demands for community marketing buildings are the enclosed retail produce market and the wholesale area market. Curb markets require special design for the few localities in the State where needed.

Camp and recreation buildings include assembly halls, kitchen and dining halls, cabins, shelter houses, shelter barracks, and sanitary facilities. The number and size of structures may be modified to conform to the size of the camp.

Community meeting places may be classified into 4 types, (1) assembly rooms, (2) auditorium, kitchen, and dining hall, (3) game or athletic courts, and (4) club houses. Usually each type may be used for more than one purpose.

Rural work centers require workrooms, storerooms, and toilet facilities, but may be elaborated to provide for shops, food processing, or specialized processing or manufacture.

The cost of the buildings, of the type shown, if built in Arkansas will average about $1 a square foot of floor space. Saving may be effected by the use of local materials and donated labor.

Directory of approved gas appliances and listed accessories, June 1, 1935; supplement to April 1 issue (*Cleveland, Ohio: Amer. Gas. Assoc., Testing Lab., 1935, pp. 7*).—The appliances listed herein are those which were approved, listed, or added to the Directory of Approved Gas Appliances and Listed Accessories during the month of May 1935.

Lighting calculations, H. H. Higbie (*New York: John Wiley & Sons. London: Chapman & Hall, 1934, pp. XI+503, figs. 115*).—This book contains chapters on illumination and light flux, candlepower and point source of light, brightness, surface sources of light, linear sources, multiplying light by reflections in

an enclosure, utilization coefficient—efficiency of the lighting system, lamps—light generators, and visual effectiveness of lighting.

Sewerage and sewage treatment, H. E. Babbitt (*New York: John Wiley & Sons. London: Chapman & Hall, 1932, 4. ed., pp. XV+596, figs. 179*).—This is the fourth edition of this book (E. S. R., 47, p. 293). In its revised form it contains chapters on work preliminary to design, quantity of sewage, hydraulics of sewers, design of sewerage systems, appurtenances, pumps and pumping stations, materials for sewers, design of the sewer ring, excavation and backfilling, trenching and tunneling, construction of sewers, maintenance of sewers, composition and properties of sewage, disposal by dilution, screening and sedimentation, septicization, filtration, the intermittent sand filter, activated sludge, sludge, miscellaneous processes of sewage treatment, industrial wastes, and a comparison of the processes of sewage treatment.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics at the Kentucky Station] (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 7–9, 16–18*).—Some findings not previously noted are reported on studies of the seasonal movement of tobacco prices; consumption of tobacco; factors affecting the price of burley tobacco; types of farming and their distribution; part-time farming near Louisville, Corbin and Barbourville, Richmond, and Lexington; and farm-tax delinquency in the State.

[Investigations in agricultural economics at the Minnesota Station, 1932–34] (*Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 6, 7*).—Included are brief statements as to the labor income of dairy farms and the most important factors affecting it, as shown by an analysis of the farm accounts of 108 farmers for 1933; the most important factors affecting the consumption of dairy products in 2,187 Minnesota households; and the changes in land values and mortgage foreclosures in Martin County during different 10-yr. periods, 1857–1932.

Agriculture in southern Africa, C. C. Taylor (*U. S. Dept. Agr., Tech. Bul. 466 (1935), pp. 342, figs. 79*).—This comprehensive study was made for the purpose of determining the present and probable future production of farm products in southern Africa. Quantities present and potential, qualities in relation to consumer demand, seasonal characteristics of supply, geographical aspects of production and export movements, and certain governmental policies that affect marketing are analyzed. The products studied were wool, mohair, cattle, dairy products, hogs, poultry, fresh deciduous fruit, dried fruit, citrus fruit, tobacco, cotton, sugar, corn, wheat, and miscellaneous grains.

"From a detailed consideration of impending agricultural developments in southern Africa the following seem evident: (1) A decrease in the production of wool, mohair, and exportable corn; (2) an increase in the production of cattle, citrus fruit, deciduous fruit, and sugar; (3) a probable increase in the production of cotton and tobacco, especially by natives in countries south of the Equator, with the exception of the Union of South Africa."

The farm real estate situation, 1933–34, B. R. Stauber and **M. M. Regan** (*U. S. Dept. Agr. Circ. 354 (1935), pp. 44, figs. 6*).—It is concluded, from the data tabulated and discussed, that important changes in the farm real estate situation during the year 1933–34 brought the first general upturn in values in more than a decade, a reduction in the frequency of distress sales, an increase in the frequency of voluntary transfers, an expansion of the farm mortgage credit facilities of the Farm Credit Administration, and the compromising, refinancing, or other adjustment of a large amount of mortgage indebtedness.

These developments are traced in large part to the upturn in farm prices and in income from farm production and to the expanded activity of the Farm Credit Administration, together with a growing recognition on the part of mortgage holders generally that the interests of both creditors and debtors would be served best by reasonable compromising of unmanageable debts.

Prices of Vermont farm real estate, T. M. Adams (*Vermont Sta. Bul. 391 (1935), pp. 31, figs. 7*).—Analyses are made of "the ratio of appraised value for taxation purposes to the sale value of 1,240 parcels of rural property" and of the effect on farm realty prices of soil, topography, distance to a State highway, distance to a rail shipping point, and other factors. The trend of Vermont land prices since 1900 is described and some of the factors affecting it are discussed.

The appraised value for taxation averaged 75 percent of sale value for the farm properties with buildings, 95 percent for farm properties without buildings, 104 percent for uncultivated land, and 100 percent for forest land. For farms with buildings the percentage increased from 59 for those selling for $4,000 or over to 103 for those selling for less than $1,000. No significant differences in ratio were found when the farms were sorted according to acreage per farm. The percentage decreased from 111 for farms valued at $9 or less per acre to 55 for those valued at from $40 to $49 per acre. The ratio for fairly level farms was 62 percent, rolling farms 72 percent, and rough farms 88 percent. There was a tendency for farms to decrease in value with increase in distance to a rail shipping point, but the differences apparently were not great enough to cause overvaluation of the relatively distant farms. There was a closer correlation between the value of farm real estate and the distance to a State highway than between value and distance to shipping point, and some tendency for the ratio of appraised to sale value to increase as distance increased.

Farms on rolling land sold for about two-thirds as much and those on rough land for about one-third as much per acre as fairly level farms. Farms on fairly level land and on rolling land located 8 mi. from a State highway were worth approximately two-thirds as much per acre as those within a mile of such highways.

The index of farm real estate (1910–14=100) increased from 69 in 1900 to 152 in 1920 and then decreased to 96 in 1933. In general farm product prices and farm land prices followed similar courses, but the changes in the case of real estate prices were less extreme.

"While the decline in farm real estate prices since 1920 has in a large measure been occasioned by the decline in the prices farmers receive for their products, the increase in taxes has been a contributing factor."

Georgia land use problems, W. A. Hartman and H. H. Wooten (*Georgia Sta. Bul. 191 (1935), pp. [5]+195, pl. 1, figs. 60*).—This is a progress report on a land use study made under an agreement between the regents of the University System of Georgia and the Bureau of Agricultural Economics, the Southern Forest Experiment Station, and the Bureau of Chemistry and Soils, U. S. D. A. Part 1 (pp. 1–51) deals with the State as a whole, while part 2 (pp. 51–195) takes up in greater detail the use of land in the Old Plantation Piedmont Cotton Belt.

It is reported that approximately two-thirds of the land area of the State is unsuited to the production of cultivated crops, that more than 37,000 farms are definitely submarginal, and that the results of the general classification of the land emphasize the need of constructive land use planning programs.

Economic studies of irrigated farms in Big Horn County, A. F. Vass and H. Pearson (*Wyoming Sta. Bul. 205 (1935), pp. 139, figs. 21*).—Analysis is made of data obtained from 184 farms in a survey made in 1929. The climate, topography, soils, transportation, and markets of the area are described. Tables are included and discussed showing by items the average farm capital, receipts, costs, and income and interest earnings. Analysis is made of the cropping systems, practices, and costs of production for beans, sugar beets, barley, and alfalfa, and of the effects of size of business, total productive work units per farm, total crop acres per farm, and other factors of production on labor income. More detailed analysis is made of the farm profits and factors affecting costs of production and labor income on farms producing field beans and sugar beets. Systems of farming are suggested for farms organized to grow sugar beets and feed steers, to grow sugar beets and feed lambs, to grow sugar beets and engage in dairying, to grow field beans and feeder lambs, to grow field beans and beef cattle, and to produce poultry, dairy, and truck crops.

Land tax delinquency in Missouri, C. H. Hammar (*Missouri Sta. Res. Bul. 224 (1935), pp. 47, figs. 12*).—This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., under a Civil Works Administration project.

Unpaid property taxes for 105 out of 114 Missouri counties rose from $3,577,010 in 1928 to $5,827,044 in 1932, in which period tax levies decreased from $28,443,640 to $22,762,193, whereas in 1933 both the volume and the percentage of current delinquency decreased in comparison with 1932. The percentage of current delinquency was heaviest in the southeast lowlands and Ozark center counties and least in the Ozark border and northern agricultural counties.

Acreage delinquency in 92 counties, which increased from 4,514,504 acres in 1928 to 10,163,319 acres in 1932, was particularly heavy in the central Ozark and southeast lowland counties. Disregarding the southeast lowlands, where special conditions exist, delinquency was greatest upon the poorer and least fertile lands.

Delinquency has apparently been about as great in the towns and cities of the State as in the rural areas, and urban delinquency was higher in 1933 than in 1932.

The acreage of lands sold for taxes in 108 of 114 Missouri counties averaged a little less than 100,000 acres per year for the period 1928–32. Receipts from the sale of lands foreclosed for taxes have been so small in recent years as to barely cover the cost of tax suits and have brought in almost nothing in terms of public revenue.

The causes of tax delinquency and measures to reduce it are discussed.

Tax delinquency on farm real estate in Texas, L. P. Gabbard (*Texas Sta. Bul. 507 (1935), pp. 24, figs. 2*).—Delinquent taxes accruing since 1885 amounted to $141,783,000 by 1933, more than half of which had accumulated since 1931. About 75 percent of the delinquent taxes were "solvent"—secured by real property, while 25 percent were "insolvent"—secured by personal property. During the past half century only about 45 percent of the solvent and 8 percent of the insolvent taxes were collected.

"Unknown" delinquent acreages ranged from 1 to 40 percent of the total delinquent acreages in 90 counties. Causes of tax delinquency in Texas were declining agricultural and other commodity prices and rising taxes; faulty assessment and collection practices; periodic remission of penalties and interest; the uncertainty of tax titles; indifference, procrastination, or misfortune of the taxpayer; and failure of the tax system to include and properly harmonize the two fundamental bases of taxation—benefit and ability. Among changes

recommended are an active and responsible participation by the State in the assessment and collection of taxes, the keeping of a complete and continuous inventory of taxable property by counties, simplification of collection procedure, simplification of court procedure relative to tax sales and harmonization with the enforcement of tax laws, imposing of penalties with reason and certainty and avoiding their remission, and the appointment of collectors on a competitive basis.

Cost of production in agriculture, J. A. HOPKINS and P. A. TAYLOR (*Iowa Sta. Res. Bul. 184 (1935), pp. 385–432, figs. 3*).—This study was made as the basis of an intelligent opinion concerning present-day proposals for agricultural reform.

Data were obtained by surveys and by records kept on farms. The difficulties of determining costs are set forth.

"Cost of production" figures are deemed to be discredited as a basis for price fixing and tariff determination, but are usable as indicators of efficiency in particular enterprises as between farms operating under essentially similar conditions and in the same year.

While price would tend to equal cost if methods of production, price levels, and volume of demand and of production remained unchanged for a protracted period, no necessary relationship exists over a short period of time in a dynamic world between cost and price.

The conclusion is reached that the alert farmer will find his interest served better by carefully budgeting or planning for the future than by any reckoning of his past costs. This has the advantage of being applicable to the farm as a whole and shows each enterprise in its proper relationship to the rest of the business.

The economics of range sheep production in Montana, M. H. SAUNDERSON and L. VINKE (*Montana Sta. Bul. 302 (1935), pp. 55, figs. 7*).—This study, conducted in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is based on a 5-yr. series of records of ranch organization and operation. One hundred records were gathered covering the 1928 data and 84 of these were followed through the 5-yr. period.

Between 1900 and 1905 there were probably more than 6,000,000 sheep in the State, including many wethers and relatively fewer lambs, but by 1920 the number had declined to about 2,000,000. Between 1920 and 1930 the number increased to about 4,200,000, and since 1930 the numbers have declined slightly and now stand at about 4,000,000. Shipments of lambs, sheep, and wool have contributed to the agricultural income of the State in proportions varying from one-sixth to one-third of the total. About one-fifth of the State's total land area is now used in sheep production.

Topics discussed are natural operating conditions and land tenure and use in relation to ranch organization, prevailing types of ranches and operating practices, three cases in ranch organization, and operating budgets and capital values in range sheep production.

The dairy cow and cotton as sources of income from the farm, J. S. MOORE and W. C. COWSERT (*Mississippi Sta. Circ. 96 (1935), pp. [3]*).—Analysis is made of the results of a project entitled The Fourteen Acre, Four Cow, Five Year Program, which had among its objectives the inclusion of dairy cows in the farm program; the growing of practically all the feed for the 4 cows on the 14 acres; the growing of cotton as an additional cash crop; the improvement of the soil through crop rotation, the growing of winter cover crops, the turning under of legumes, and the use of barnyard manure; determination of whether more profitable land utilization is possible than under present average conditions; and

determination of whether better distribution and more profitable employment of labor on the farm is possible.

During the 5 yr., all feed for the 4 cows except 718 lb. of cottonseed meal was raised on the farm; the total net return from crops was $692.41; and the total net return from cows was $530.62. Had the entire area suitable for cultivation been in cotton the net return would have been $380.57. Required labor was more evenly distributed on the diversified farm than it would have been with cotton alone.

"The results as a whole show that combined dairy and cotton farming furnishes more revenue than cotton farming alone; that conditions are much more favorable for maintaining and increasing soil fertility; that we may utilize more land at a profit; that labor may be distributed throughout the year to better advantage; and that a complete failure in any year is not likely to occur."

Factors causing variations in earnings among dairy farmers in southeastern Minnesota, G. A. Pond, W. P. Ranney, and C. W. Crickman (*Minnesota Sta. Bul. 314 (1934), pp. 83, figs. 17*).—This is the first of a series of publications dealing with factors affecting the organization, productive efficiency, and earnings of dairy farms in southeastern Minnesota. It is based on records kept by farmers cooperating with the experiment station and extension service of the University of Minnesota and the Bureau of Agricultural Economics, U. S. D. A. During the years 1928–1932, inclusive, 766 farm records were obtained in eight counties.

The type of farming, soil, topography, and climate of the area and size, land utilization, crop yields, kinds and amount of livestock, capital investment, etc., of the farms included in the study are described. Tables are included and discussed showing the variations in average income, expenses, and earnings from year to year of the farms included and in the earnings of identical farms from year to year, and the range of earnings among the farms. Analysis is made of the relation of the following primary organization and management factors to earnings: Size of business, choice of crops, intensity of livestock production, crop yields, butterfat production per cow, returns over feed from livestock other than cows, productive man work units per man, and power, machinery, and improvement expense per productive man work unit. An appendix includes definition of terms and a description of the methods used in computing earnings and organization and management factors.

Productive man work units was selected as the most satisfactory measure of size of business; an index of crop selection based on the relative profitableness of different crops in the area was used as a measure of the quality of the cropping system; and productive animal units per 100 acres were used to measure intensity of livestock production. Efficiency in use of labor was measured by the number of productive man work units per man.

Crop yields and labor efficiency were higher and butterfat production per cow and power and machinery costs per unit of work lower on the larger farms. In 1928 and 1929, when prices were relatively favorable, earnings increased with increases in size of the business unit. In 1931 and 1932 the opposite trend was observed. Large farms with high production suffered much less relative decline in earnings in 1931 and 1932 than did those with small production. Earnings increased with increase in the index of crop selection. The increase was somewhat less regular in the low-price years, 1930 to 1932. Intensive livestock production was associated with high crop yields and high index of crop selection. From 1928 to 1932 earnings increased with the amount of livestock per 100 acres. In 1932, with its extremely low prices for livestock and livestock products, there was no definite relationship. Relatively high crop yields were associated with high earnings each year, the advantage being greatest on the

large farms. The farmers obtaining a relatively high butterfat production per cow realized the higher earnings each year, the relationship being fairly constant regardless of size of farm. A relatively high return over feed cost from livestock other than cows was associated with higher earnings each year. High efficiency in the use of labor and low expense for power, machinery, buildings, and fences per day of productive work were both associated with high earnings. "For each additional factor in which a farmer attained better than average accomplishment, there was an average increase in earnings of nearly $300."

Milk-distribution costs in West Virginia.—I, A study of the costs incurred by 22 plants during 1933, R. O. Stelzer and L. M. Thurston (*West Virginia Sta. Bul. 266 (1935), pp. 36, figs. 2*).—In this study, based on cost records obtained from 22 milk-distributing plants in West Virginia for 1933, the average cost of distributing milk was $2.05 per 100 lbs. of milk purchased. An average of $1.64 was paid for the milk used for fluid-sales purposes, and the total cost of milk and cost of distributing averaged $3.69 per 100 lb., or 7.94 ct. per quart.

Labor amounted to 84.1 ct. per 100 lb., or 41 percent of the distributing cost. Depreciation costs averaged 22 ct., the range being from 8.4 to 33.4 ct. Supplies, repairs, taxes, insurance, and such other items incurred in the care and operation of the buildings and equipment cost 57.5 ct. Other distribution costs were loss of milk 4.7 ct., bad debts 7.0, interest costs 17.7 (4.4 ct. of which was paid on borrowed capital), advertising 2.2, and all other costs 9.8 ct. per 100 lb. of milk purchased. The cost of distribution varied because of (1) size of plant, (2) size of unit sold, (3) investment per 100 lb. of milk purchased, (4) cost of labor, (5) efficiency of labor, (6) loss of milk, (7) bad accounts, (8) efficiency of routes, and (9) cost of administration.

"An average of 1,663,034 lb. of milk was purchased in 1933 by each plant, the largest plant purchasing more than 5,000,000 lb., while the smallest purchased 203,228 lb. Of the total quantity of milk purchased, approximately 53 percent was sold as fluid milk, 19 percent as fluid cream, and 23 percent as other products (buttermilk, chocolate milk, skim milk, cottage cheese, and surplus cream), while the remaining 5 percent was lost or not accounted for in the disposal figures. The data indicate that approximately 70 percent of the fluid sales of milk and cream were at wholesale prices and the other 30 percent at retail prices.

"The gross sales value of the fluid sales was $3.568 per 100 lb. of milk purchased for 17 of the 22 plants. This represents a gross sales value of 7.67 ct. per quart of milk. These same 17 plants paid $1.641 per 100 lb. of milk. . . . A profit of 1.2 ct. per 100 lb. was equal to a return of 0.44 percent on the average investment for the year, or is equal to 1 ct. profit for every 39 quarts of milk equivalent sold. Seven of the 17 plants did not make any returns on their investment. The small return on the investment for 1933 would indicate that any increase in the cost of milk to the plants would necessitate a corresponding increase to the consumer unless the distributing plants can reduce their costs or are willing to operate at a loss."

Farmers' cooperative associations in Florida.—III, Business analysis of the Hastings Potato Growers' Association, H. G. Hamilton and M. A. Brooker (*Florida Sta. Bul. 276 (1935), pp. 63, figs. 5*).—The purpose of this bulletin, the third in the series previously noted (E. S. R., 70, p. 706), is "to analyze the organization and the management policies of a relatively successful cooperative association engaged in the handling of Florida truck crops, in order to bring out, if possible, some of the experiences and practices which may prove helpful to other cooperatives engaged in similar undertakings."

The development of the potato industry in Florida and the conditions leading up to the incorporation of the Hastings Potato Growers' Association, July 1, 1922, and its organization are described. The association's marketing operations—grading and pooling, selling, field department, and nonmember business; its purchasing of supplies for growers; its sinking fund; and its extension of credit to members are discussed. Analysis is made for the 12 years 1922–23 to 1933–34 of operation of the association as shown by profit and loss statements and the status of the association at the end of each season as shown by balance sheets. The Hastings Agricultural Credit Corporation, a subsidiary of the Hastings Potato Growers' Association, is described, and comparative balance sheets and profit and loss statements for the different years, and other statistical data, are given.

Appendixes include the bylaws and the grower's application for membership in the Hastings Potato Growers' Association.

Index numbers of Idaho farm prices, C. O. Youngstrom (*Idaho Sta. Bul. 210 (1935), pp. 53, figs. 21*).—The farm price indexes covering 17 important Idaho farm products are presented for the period 1910–34 (base period 1910–14).

"Idaho farm prices have moved in the same general direction as have United States farm prices, but because Idaho is in the main a surplus producing State, located at long distances from markets, price fluctuations as measured by the Idaho farm price index have been of somewhat greater magnitude than have changes in prices for the country as a whole."

Local prices of livestock commodities in Minnesota, L. F. Garey (*Minnesota Sta. Bul. 316 (1935), pp. 35, figs. 24*).—The prices of hogs, beef cattle, sheep, chickens and eggs, and butterfat in different localities of the State are analyzed. Quantity of production in a locality, quality, and distances from market were responsible for the fluctuations found.

RURAL SOCIOLOGY

Wealth accumulation by farmers, L. F. Garey (*Social Forces, 11 (1932), No. 1, pp. 120–127; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, pp. 20*).—Analysis is made of data obtained in a survey made in 1929 in an important potato section of Clay County, Minn. Seventy-six owners who began farming as tenants, 73 farmers who were tenants at the time of the survey, and 112 other farmers, some of whom inherited their farms or purchased them from earnings in some other capacity than as farm operators, were included.

The average annual accumulation of wealth by the 76 owners who were once tenants was $1,442 during their period of ownership; that by 149 tenants averaged $203. Farmers inheriting their farms had the greater accumulation. Farmers with large families had no apparent advantage in annual wealth accumulation over those with small families or no children. Those who purchased land between 1922 and 1927 had greater annual accumulation than those who purchased between 1917 and 1922 or between 1910 and 1917.

The rural church in Missouri, M. W. Sneed and D. Ensminger (*Missouri Sta. Res. Bul. 225 (1935), pp. 75, figs. 26*).—This report presents results of a quantitative study using 3,000 rural churches in Missouri as a sample.

The rural area was divided into seven classifications of population ranging from open country to places with from 1,500 to 2,500 people.

It was found that the small size of the rural churches contributed to infrequent services, low-salaried pastors, and other difficulties, which seem to have been accentuated by the present emergency.

For the total rural area, church membership averaged 107.12; 43.67 percent of the churches had less than 70, 63.09 had less than 105, while 16 percent had

less than 85 members. Approximately 43 percent of the total membership was male. The average number of families per church was 43.82, and the average size of family approximately 2.39 persons. More than half of the membership of the rural church travels no more than 2 mi.

Less than one-fourth of the churches held full-time services, while almost one-half conducted one-fourth-time services. About two-thirds of this latter group were in the open country and villages of 200 or less population.

Approximately 75 percent of the churches conducted a revival annually, lasting about 2 weeks. Evangelists conducted 30.69 percent of the revivals, while 41.93 percent were conducted by the local pastor.

More than 85 percent of the churches were not used by extracongregational groups.

Approximately 49 percent of the churches had nonresident pastors, while 36.93 percent had resident pastors.

Of the pastors serving open country churches, 40 percent had attended no higher institution of learning than high school and more than 20 percent had not gone beyond the grade school. On the other hand, in the larger villages, 90 percent of the pastors had received training beyond high school. The pastors' salaries averaged $968.33 annually; more than three-fourths of the churches provided less than $1,000 annually, while in places having 1,500 to 2,500 population only one-fifth of the salaries were less than $1,000. Pastors received less not only in sparsely populated communities but also less when serving more than one church.

Rural church expenditures in 1933 were about one-third less than in 1920. The rural churches have been established, on the average, for about 50 yr., while more than 8 percent of the churches reported had been established since 1925. Of the more recently established churches, approximately one-half were of the united types.

The average number of members per church increased as the frequency of services increased, from an average of 34.54 members in inactive churches to an average of 196.41 members in churches conducting full-time services.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

An analysis of the cost of pupil transportation in Arkansas, R. W. Roberts (*Arkansas Sta. Bul. 316 (1935), pp. 51*).—This study dealt with the determination of factors affecting the cost of pupil transportation in Arkansas and cost predictions based upon these factors. Data were obtained from 965 vehicles operating in 261 Arkansas school districts receiving State aid for pupil transportation in 1930–31. The average cost per pupil per year was $15.21 for school-owned, $18.84 for contract, and $17.65 for private transportation. The cost per bus per year was $662, $685, and $70, respectively, for the three types of ownership. The cost per bus per day for school-owned and contract transportation was $4.39 and $4.66, and the cost per bus mile was 19 ct. and 24 ct., respectively.

Two plans are presented and a third suggested for predicting the cost of pupil transportation, and recommendations are made for improving and lowering the cost.

[Relation of agronomic research to extension] (*Jour. Amer. Soc. Agron., 27 (1935), No. 6, pp. 413–428*).—The papers in the group included: The Interdependence of Agronomic Research and Resident and Extension Teaching, by F. S. Owens (pp. 413–416); Helps to Extension Workers in Determining the Needs of Soils and Crops, by E. Van Alstine (pp. 417–421); and A Coordinated Program for Research and Extension, by C. H. Myers (pp. 422–428).

FOODS—HUMAN NUTRITION

A textbook of biochemistry, edited by B. Harrow and C. P. Sherwin (*Philadelphia and London: W. B. Saunders Co., 1935, pp. 797, figs. 52*).—In this textbook, which has been planned for teachers and students of medicine, chemistry, and allied branches, the individual chapters have been contributed by specialists in the various fields of biochemistry. Among the chapters dealing more particularly with nutrition are the following: Nutrition, by E. V. McCollum (pp. 254–262); The Vitamins, by J. C. Drummond (pp. 263–306); Enzymes (pp. 307–321) and Digestion (pp. 322–332), both by I. S. Kleiner; The Carriage of the Blood Gases and the Acid-Base Equilibrium of the Blood (pp. 441–461) and Respiration and Respiratory Metabolism (pp. 462–489), both by H. E. Himwich; Animal Pigments, by C. S. Leonard (pp. 490–511); Oxidations and Reductions, by B. Cohen (pp. 512–535); Carbohydrate Metabolism, by C. F. and G. T. Cori (pp. 536–577); Lipid Metabolism, by W. R. Bloor (pp. 578–611); The Metabolism of Proteins and Amino Acids, by J. M. Luck (pp. 612–644); Mineral Metabolism, by A. T. Shohl (pp. 645–654); Bone and Teeth, by J. Knaggs (pp. 655–665); Function of Water in the Organism, by L. G. Rowntree (pp. 666–672); and the Chemistry of Muscle, by P. Eggleton (pp. 673–688).

Annual review of biochemistry, III, IV, edited by J. M. Luck (*Stanford Univ., Calif.: Stanford Univ. Press, 1934, vol. 3, pp. VIII+558; 1935, vol. 4, pp. VII+639, figs. [4]*).—Following the plan announced in the first volume of the series (E. S. R., 70, p. 438), these two volumes continue the annual reviews, sometimes under different authorship, of many of the topics of the earlier volumes, and in addition present reviews of new topics to be included less frequently.

Topics pertaining to nutrition in volume 3 include, in addition to those noted in the earlier volumes, Water in Its Biochemical Relationships, by R. A. Gortner (pp. 1–22); Mineral Metabolism—Sodium, Potassium, and Chlorine, by A. T. Shohl (pp. 209–224); Liver and Bile, by J. L. Bollman and F. C. Mann (pp. 367–380); The Metabolism of Brain and Nerve, by E. G. Holmes (pp. 381–399); The Biochemistry of Malignant Tissue, by E. Boyland (pp. 400–409); Animal Pigments, by A. R. Mirsky and M. L. Anson (pp. 425–440); and Biochemical and Nutritional Studies in the Field of Dentistry, by M. Koehne and R. W. Bunting (pp. 441–458).

In volume 4 the special topics not covered hitherto include Detoxication Mechanisms, by B. Harrow and C. P. Sherwin (pp. 263–278); Choline and Allied Substances, by J. H. Gaddum (pp. 311–330); Chemical Embryology, by J. Needham (pp. 449–468); and Immunochemistry, by M. Heidelberger (pp. 569–592).

Nutrition and physical fitness, L. J. Bogert (*Philadelphia and London: W. B. Saunders Co., 1935, 2. ed., rev., pp. 566, figs. 65*).—In this revision of the volume noted previously (E. S. R., 68, p. 855), the chapter on vitamins has been rewritten, "incorporating much new material and treating the properties and effects of the individual vitamins separately." Among other changes has been the revision of the chapter on constipation to include a discussion of the two contrasting types, atonic and spastic, with menus for treating each type.

Nutrition and disease, E. Mellanby (*Edinburgh: Oliver & Boyd, 1934, pp. XIX+171, figs. 61*).—This volume, representing the substance of the Croonian Lectures delivered to the Royal College of Physicians (Great Britain) in June 1933 and the Linacre Lecture given at Cambridge University in May 1933, covers several of the problems which have been under laboratory and clinical investigation by the author during a period of 13 yr. The various chapter headings are rickets, dental structure and disease, the thyroid gland—simple

and toxic goiters, nutrition and infection, nutritional influences on the nervous system—experimental work on animals, and extension of experimental results on nerve degeneration to some other clinical conditions. Each chapter contains a discussion of the literature, data from the author's own investigations on the subject, some of which have been noted from other sources, and a list of literature references.

The structure and composition of foods.—II, Vegetables, legumes, fruits, A. L. and K. B. WINTON (*New York: John Wiley & Sons; London: Chapman & Hall, 1935, vol. 2, pp. XIV+904, figs. 303*).—This volume continues the series noted previously (E. S. R., 67, p. 472). The introduction contains a discussion of the chemical features common to fruits and vegetables, supplementing brief statements made in the introduction to volume 1. Special attention is given to the chemistry of the five groups of plant pigments—chlorophylls, carotenoids, flavones and flavonols, lyochromes or flavines, and anthocyanins. There is also a discussion of the chemistry of the vitamins, although vitamin values are not included in the data on individual fruits and vegetables. As in the first volume, each material included in the text is discussed from the standpoint of occurrence, microscopic and macroscopic structure, and proximate and mineral composition, with footnote references to the original literature.

The chemistry of flesh foods and their losses on cooking, R. A. MCCANCE and H. L. SHIPP (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 187 (1933), pp. 146, figs. 36*).—This extensive report consists of three parts dealing, respectively, with the analytical methods employed; the chemical data obtained in the analysis for proximate and mineral composition of fresh and preserved fish, shellfish, fresh and preserved meat, poultry and game, and edible organs cooked in various ways, and of a few raw foods; and a discussion of the losses brought about by cooking as revealed by the analyses reported. Among the practical conclusions are the following:

From the viewpoint of the finished product, pressure cooking "has no advantage over steaming at 100° C., however economical it may be in time and fuel. When these two methods of cooking are compared with heating in water, they both have the advantage that all loss due to leach is avoided. . . . It has been shown in this investigation that anything tending to reduce evaporation from a roasting joint may appear to make the joint more juicy, but tends to increase the salt loss. On grounds of palatability, therefore, the electric oven or the covered pan may be beneficial, but chemically the evidence is rather the other way. No evidence has been found that a pellicle forms on the outside of a joint when cooking commences at a high temperature. Unless, therefore, the procedure can be supported on grounds of palatability or digestibility, there seems no reason why an oven should be raised to a high temperature before the joint is inserted, or why the water should be boiling before the meat is put in. Both would appear, indeed, to be a waste of heat. . . . All methods of cooking meat that are attended with evaporation tend to conserve the salts and the extractives in the meat. Roasting, grilling, and, above all, frying have been found to lead to smaller salt losses than steaming or boiling."

Utilization of meat by human subjects.—I, The utilization of the nitrogen and phosphorus of loin and heel cuts of beef, M. S. PITTMAN, R. B. MCCAMMON, and M. HOLMAN (*Jour. Nutr., 8 (1934), No. 5, pp. 503–507*).—In this contribution from the Kansas Experiment Station, nitrogen and phosphorus balance experiments are reported for three healthy young women on diets in which equal weights of the loin and heel of beef from the same carcass were the only variants. The meat was taken in amounts of 165 g daily, furnishing in the case of the loin 36.6 g of protein and 0.341 g of phosphorus and of the

heel 38.5 g of protein and 0.482 g of phosphorus. Each experiment consisted of a 4-day preliminary and two 4-day experimental periods.

In the beef loin experiment the average daily retention of nitrogen for all of the subjects for the entire 8 days was 0.59±0.08 g, with two subjects in slight negative balance on each of 2 days. On the beef heel the average daily retention of nitrogen was 0.05±0.09 g, with negative balances in half of the experimental days. The coefficients of digestibility of the nitrogen for the various subjects ranged from 69.5 to 91.3 percent, with an average of 81.3 percent, for the loin and from 63.8 to 87.7 percent, with an average of 78.8 percent, for the heel. Urinary nitrogen values were 0.064 g per kilogram per day for the loin and 0.069 g for the heel. Collagen nitrogen in percentage of total nitrogen was twice as high in the heel as in the loin and elastin nitrogen about the same.

The phosphorus balances were negative throughout and slightly less favorable on the heel than on the loin. The difference in average phosphorus balances for all the subjects on the two meats, however, was only −0.244±0.126 g.

The practical conclusion drawn from this study is that "when heel of beef is substituted for loin in the diet as a source of nitrogen and phosphorus, the amount should be increased slightly, since these elements appear to be somewhat better used from the more tender cut."

Nutritional value of human milk, cows' milk, and goats' milk, E. von Haam and H. H. Beard (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 5, pp. 750–753*).—Observations under conditions as nearly identical as possible of the effect of feeding human milk, cow's milk, and goat's milk upon the development and blood picture of growing albino rats are reported and discussed.

None of the 17 animals in 6 litters fed human milk became anemic. Among the 28 animals in 8 litters fed cow's milk, 7 animals in 3 litters developed anemia and 2 died. Of the 33 animals in 8 litters fed goat's milk, 26 in 7 litters developed anemia and 18 died.

The number of erythrocytes in the blood increased slowly but continuously in the animals fed human milk and decreased in both of the other groups, the decrease being more rapid on goat's milk than on cow's milk. This is thought to indicate that the anemia on goat's milk is of hyperchromic character, while that on cow's milk is distinctly hypochromic.

Studies of the values of different grades of milk in infant feeding, III, J. A. Newlander and C. H. Jones (*Vermont Sta. Bul. 389 (1935), pp. 40*).—In this continuation of the investigation noted previously (E. S. R., 36, p. 558), the relative values of normal cow's milk, evaporated milk, two brands of powdered whole milk, and homogenized milk were compared for their suitability for infant feeding by feeding experiments on pigs from the age of 2 days to from 2 to 5 weeks. The general plan was the same as in the earlier study except for the younger age of the animals at the beginning of the experiment. On the assumption that each week of early porcine life corresponds approximately to 2 or 3 mo. of an infant's life, a period of 5 weeks is thought to correspond to the first year in the life of a child.

From comparisons of animal vigor, total gains, amount and economy of dry matter gain, and body composition, the authors rank the different forms of milk tested in the decreasing order of normal milk, evaporated milk and powdered milk No. 2, and homogenized milk and powdered milk No. 1.

In comparison with pigs on sow's milk, the dry matter gains were favorable on the normal milk, evaporated milk and powdered milk No. 2, less favorable on powdered milk No. 1, and least favorable on homogenized milk. In economy of dry matter gains, the normal milk ranked first, followed closely by the evaporated milk and powdered milk No. 2, and less closely by the powdered milk No. 1 and homogenized milk.

"Marked changes in body composition occurred coincident with increased age. Baby pigs at birth contain about 80 percent water, protein comprises the greater part of their dry matter content, averaging over 60 percent, while their ash and fat contents each average 17 percent, the fat to protein ratio being about 1:3.6. As age advances, the dry matter and fat percentages decidedly increase. In a well-developed pig at weaning age, the dry matter percentage will be approximately 50 percent greater and of fat 150 percent greater than they are at birth, and the relative percentages of fat and protein will be nearly equal.

"Stomach capacities of the check and experimental pigs were determined at slaughtering time. The data obtained indicate that, with the possible exception of some of the initial feedings, there was ample room for the quantities of milk given at a feeding."

Baking angel food cake at any altitude, M. A. Barmore (*Colorado Sta. Tech. Bul. 13 (1935), pp. 15, figs. 4*).—This publication gives the practical applications of a study of the effects of reduced atmospheric pressure on the proportions of the various ingredients required for making a satisfactory angel food cake. The study, which is a continuation of the investigation of the fundamental effects of reduced atmospheric pressure, the first phase of which has been noted previously (E. S. R., 72, p. 275), led to the derivation of a mathematical equation relating the effects of the ingredients to the tenderness value of the cake. From this equation recipes have been calculated for altitudes varying from sea level to 15,000 ft., and are presented in tables showing the quantities of sugar in tablespoonfuls, grams, and ounces required for varying amounts of flour at the different altitudes, together with the fixed quantities of the other ingredients. The method of using these tables at any altitude is described, and suggestions are given for the measurement and manipulation of the ingredients, choice of utensils, range of satisfactory baking temperature, and differences to be expected from different brands of flour, different amounts of cream of tartar or the use of some other acid, and the size of the sugar particles. The entire procedure is summarized, and causes and prevention of failures are discussed.

It is of interest that with the necessary decrease in sugar for a given amount of flour at increasing altitudes a point is reached at altitudes above 10,000 ft. when cakes of satisfactory texture contain so little sugar in proportion to their flour content that they can scarcely be called cakes and a thick icing is desirable.

Further observations on the "digestibility" of common foodstuffs as determined by radiography, W. C. D. Maile and K. J. L. Scott (*Lancet [London], 1935, I, No. 26, pp. 1500, 1501*).—This paper reports a continuation of radiographic observations on the emptying time of the stomach after the ingestion of various food materials rendered opaque with barium (E. S. R., 73, p. 412).

The first materials studied were cane sugar, glucose, and honey in 2-oz. quantities. Honey alone required 4 hr. for complete emptying of the stomach. When dissolved in ½ pt. of water the time was lowered to 1½ hr. Cane sugar dissolved in 1 oz. of water required 2⅝ hr. for emptying and dissolved in 10 times as much water (½ pt.) only 1½ hr. Glucose dissolved in ½ pt. of water required a slightly longer time than sucrose, 1¾ hr.

In two boys 8 and 6 yr. of age, the emptying times of the stomach after the ingestion of 2 oz. of sugar in ½ pt. of water were 4 and 3¾ hr., respectively, showing that the child's stomach does not deal with sugar as rapidly as the adult's. A comparison of the emptying time of the stomachs of children and

adults after the ingestion of ½ pt. of rich raw milk showed that the emptying time for milk in children is much shorter than in adults if one takes into account the disproportion between the amounts given and the size of the stomach.

Various forms of milk preparations were tested on adults in amounts of ½ pt., with the following results: Rich, raw milk, cold, 3½ hr., skim milk, cold, 2¼, rich milk boiled 2⅝, citrated milk 3¼, peptonized milk 3¾, milk with 2 oz. of sugar 3½, alkaline milk 3¼, and milk boiled with a patent barley 3 hr. These findings indicate that none of the usual methods employed to increase the digestibility of milk, with the exception of boiling, has much effect on the emptying time of the stomach.

Observations are also reported on the effect of taking the fluid part of the meal (tea or coffee) 5 min. before or 5 min. after the meal. In three separate studies with different subjects and different meals, the taking of fluid after the meal hastened by from ½ to ¾ hr. the passage of the food through the stomach.

Experiments on nutrition.—XIII, The relative values of proteins, R. H. A. Plimmer, J. L. Rosedale, W. H. Raymond, and J. Lowndes (*Biochem. Jour.*, *28* (*1934*), *No. 5, pp. 1863–1886, figs. 5*).—In this continuation of the series of papers most of which have been noted (E. S. R., 67, p. 634), data are reported on an extensive investigation of the relative nutritive value of different proteins as determined by the growth method on chickens. Calculating the value of the proteins numerically as I^2/TP, in which I equals increase in weight, T length of experiment (5 weeks in the calculations reported), and P protein consumption, and arranging the mean values of the relative numbers in two series of experiments, the authors give the following list in an order which is thought to be probably correct except in one or two cases: Fresh egg white 130.6, fresh egg yolk 100.9, caseinogen 100, fishmeal 85.3, dried egg yolk 80.5, fat-free meatmeal 74.1, wheat germ 68, meatmeal 62.8, dried yeast 62, soybean 55.6, dried egg white 51.2, bloodmeal 48, split peas 45, beanmeal 36.3, lactalbumin 31.6, alfalfa 25.6, grass 22, and lentils 19.

The effect of the interior pituitary growth hormone on protein metabolism, N. K. Schaffer and M. Lee (*Jour. Biol. Chem.*, *108* (*1935*), *No. 2, pp. 355–371*).—The effect of short periods of treatment with anterior pituitary growth hormone on certain nonprotein nitrogen constituents in the carcass as a whole and in the liver and muscle tissue was determined in rats, using the paired feeding method.

The hormone treatment was followed by decreases in the free amino acids, peptide amino acids, and urea in all of the tissues. The reverse was true of the hypophysectomized rats. The total nitrogen content of a series of 5 hypophysectomized animals was 22 percent less than that of 5 control litter mates.

These findings, together with previous work, are thought to indicate that the growth hormone is a specific stimulant of protein anabolism.

Tryptophan deficiency, R. S. Alcock (*Biochem. Jour.*, *28* (*1934*), *No. 5, pp. 1721–1728, figs. 5*).—In attempts to devise a more satisfactory tryptophan-deficient diet than that of Berg and Rose (E. S. R., 62, p. 191), almost universally used, it was found that by substituting zein for nearly all of the hydrolized casein and using no cystine, extensive losses in weight were prevented and the animals remained in better condition. As noted in an earlier paper (E. S. R., 71, p. 130), anemia did not develop. However, the addition of tryptophan to this diet did not bring about great improvement in the growth rate. The injection of tryptophan was likewise without effect, although the animals responded normally to oral tryptophan subsequently.

This is thought to demonstrate that the limit to growth is not imposed by the inability to make the tryptophan necessary for tissue proteins. In further illustration of this, it is noted that a rat was carried through gestation without loss of weight on the tryptophan-free diet and gave birth to a litter of six. Although the animals in the litter were small and still-born, their tissues had been made without any exogenous tryptophan. In a brief series of tests in which rats on the tryptophan-free diet were given daily injections of anterior pituitary growth hormone, their weights increased steadily during the 15 days of the experiment and showed no sudden falling off at the end.

This ability of the animal to synthesize proteins while receiving no tryptophan is thought to indicate that "for this particular purpose it is able to make its own tryptophan. This carries with it the implication that the synthesis of protein probably starts at a lower stage than the fully formed amino acid, and that the amino acid groups actually found in the animal proteins have been formed there, not assimilated from the blood stream as such. This brings the synthesis of protein in the animal into line with that in other organisms, in particular the plant, where the nitrogen source in protein building is necessarily of a simple nature."

The effect of a high fat meal on the respiratory quotient and heat production of normal and obese individuals, B. D. Bowen, F. R. Griffith, Jr., and G. E. Sly (*Jour. Nutr., 8 (1934), No. 4, pp. 421–434, figs. 2*).—The effect of a high-fat meal (fat 128 and protein 2.7 g, with a trace of carbohydrate) on the respiratory quotient was studied, the minimum, maximum, and average fasting respiratory quotients being 0.76, 0.88, and 0.825, respectively, for 12 normal subjects, 0.72, 0.83, and 0.765 for 20 obese nondiabetic subjects, and 0.73, 0.83, and 0.767, respectively, for 11 obese diabetic subjects.

In the normal subjects after the fat meal there was no change in the respiratory quotients at the end of an hour. At the end of the second hour the quotient was depressed (average 0.80) and remained at this level to the sixth hour, when a beginning trend upward was noted. In the obese nondiabetic group the respiratory quotients rose steadily to an average of 0.805 at the end of 2 hr., dropping to 0.79 at the fourth hour. In the obese diabetics there was a slight rise and a more rapid return to normal.

The total extra calories during absorption and assimilation of the fat were essentially the same for the obese nondiabetic (25.25 calories) and normal (26.15 calories) groups, but in the obese diabetic group the total extra calories were 23 percent higher than the average of the other groups. The basal metabolic rates were within the normal average, with 3 exceptions.

The most significant finding is thought to be that the post-absorptive respiratory quotient in the obese group is lower than normal. Possible reasons for this are discussed.

Cellulose in the diet of rats and mice, C. M. McCay (*Jour. Nutr., 8 (1934), No. 4, pp. 435–447, figs. 2*).—The author, with the assistance of C. C. Ku, J. C. Woodward, and B. S. Sehgal, has extended an earlier study of the effect on growth of rats of feeding purified cellulose at very high levels (E. S. R., 62, p. 688) to determinations of the effect of this high cellulose diet upon the life span, the influence of other inert materials on the growth of rats and their tolerance to roughage, the digestion of cellulose from various sources, and the weight and moisture content of the feces of rats on high cellulose diets.

Rats fed diets containing from 10 to 20 percent of cellulose outlived animals of the same sex fed a stock diet. The increase in the life span is thought to be due to the slow rate of reaching maturity (E. S. R., 69, p. 752) rather than to the direct influence of cellulose. It was found possible to adjust the com-

position of the diet so that as good growth was obtained in both rats and mice on diets containing 20 percent cellulose or agar as on diets lacking roughage. During an epidemic of diarrhea among the mice those on the high-cellulose diet were not affected. In some of the rats signs of intestinal irritation were found on the high-roughage diets, but with no evidence that the irritation led to permanent injury. Rice hulls proved no more irritating than bran or regenerated cellulose, and the more finely divided cellulose produced the least irritation.

In experiments to determine the relative digestibility of different types of roughage, beet pulp was digested to the extent of 40 percent and bran and regenerated cellulose to about 20 percent, slightly better digestion taking place with both materials at 3 percent than at 6 percent levels. The dry weight of the feces on the high-cellulose diets was greater than could be accounted for by the ingested cellulose. No relation could be established between the moisture content of the feces and the level of roughage ingested except in the case of agar, which showed a direct relationship.

Bibliography of the more important heavy metals occurring in food and biological material (*Cambridge, Eng.: W. Heffer & Sons, 1934, pp. 30*).—This bibliography covers the literature for the years 1921–33 on antimony, bismuth, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, thallium, tin, and zinc. The lists contain a number of additions to the lists originally published in the *Analyst* (E. S. R., 69, p. 752).

Inorganic salts in nutrition.—IX, Correlation between suppressed growth and the development of polycythemia induced by feeding a ration poor in salts, P. P. Swanson and A. H. Smith (*Jour. Nutr., 8 (1934), No. 6, pp. 659–667, figs. 2*).—In a continuation of earlier studies in which severe and true experimental polycythemia was induced in rats by greatly reducing the inorganic content of an otherwise adequate ration, with casein as the dietary protein, it was found that rats varied in their response to the deficient diet although all weighed 120 g at the beginning of the experiment. It was found possible to place the entire 65 animals in three groups, depending upon the final weight reached. The animals in group 1 grew at a retarded rate for a period of 32 days, attaining an average weight of 158 g and maintaining this through the rest of the experimental period of 3 mo. In group 2 subnormal growth continued for 56 days, after which the body weight of 183±8.8 g remained constant for the rest of the period. The animals in group 3 grew slowly for nearly the entire period, at the end of which the average body weight was 199±7.8 g. The average red cell counts of the three groups at the end of the period were 12,000,000, 10,700,000, and 9,900,000, respectively, thus showing an inverse relationship between growth and polycythemia.

These and the earlier experiments were conducted at Yale University. On repeating the experiments with another strain of rats at Iowa State College, it was found necessary to continue the experiment over a much longer period to obtain polycythemia. On modifying the technic by arbitrarily cutting the preliminary period to 9 days, the animals reaching an average weight of only 104 g at the beginning of the experimental period, the growth period was reduced to about 1 mo., with maintenance of constant weight thereafter. Under these circumstances the curve for polycythemia approached that of the earlier study. A definite period of inhibited growth is thus shown to be of greater importance for the development of polycythemia than is the level at which such inhibition occurs.

The development of polycythemia was accompanied by a characteristic marasmic condition which is described in considerable detail.

Calcium and phosphorus studies, X, XI (*Bul. Johns Hopkins Hosp., 55 (1934), No. 5, pp. 309–313, fig. 1; pp. 314–334, figs. 5*).—In continuation of the series of papers which have been noted in part (E. S. R., 71, p. 285), two papers are presented.

X. *The effect of variation of calcium, phosphorus, and of vitamin D in diet on iron retention in rats*, D. H. Shelling and H. W. Josephs.—Small groups of rats starting at 21 days of age were fed diets (1) high in calcium and low in phosphorus, (2) high in phosphorus and low in calcium, and (3) optimal in calcium and phosphorus. At the end of 10, 25, and 40 days, 2 animals from each group were killed, the hemoglobin in the heart blood was analyzed for iron by the Newcomer method, and portions of the entire ashed animal were analyzed for iron. In another series the high and low calcium diets were supplemented with 1 percent of viosterol 1–D.

Both hemoglobin and iron retention values were much lower in the rats fed diets of high calcium and low phosphorus content than in those fed the other diets, with and without viosterol. The retention was even lower on the high calcium and low phosphorus diet than in rats fed certified milk of extremely low iron content. Viosterol increased the retention of iron in rats on the high phosphorus diet, but had no effect in the high calcium diets. It is noted that the experiment is preliminary in nature and that no conclusions can be drawn.

XI. *Effect of prophylactic and curative doses of standardized viosterol on human tissues: Necropsy report of 13 cases showing no tissue damage*, D. H. Shelling and D. A. Jackson.—In discussing the conflicting literature on the effects of large doses of irradiated ergosterol, the comment is made that in "5 yr. of experience with the nse of standardized viosterol in fairly large doses in several hundred children, manifest symptoms of viosterol overdosage were never encountered, although the amounts given to some were from 5 to 10 times the ordinary therapeutic dose; and the duration of administration, in some instances, was more than 2 yr."

Evidence is presented in the present paper on the harmlessness of large doses of viosterol on the basis of necropsies of 13 children who had received standardized viosterol in doses ranging from 5 to 50 drops daily for periods of 23 days to 13½ mo., but who had died from other causes. No evidence of toxicity was found in the soft tissues or skeletons of any of the subjects. On the contrary, the bones of some of them on X-ray examination showed evidence of superior rather than abnormal calcification. In one of the children who had had disseminated tuberculosis from early childhood, calcification was found in no other soft tissues in the body except the peribronchial lymph nodes and in tubercles. One of the colored children who had received but 5 drops, or 415 Steenbock units, of viosterol daily as a prophylactic measure from the first month of life until his death at the age of 14½ mo., had been completely protected against rickets by this small dosage.

Studies on the metabolism of copper, E. J. Coulson, R. E. Remington, and K. M. Lynch (*U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., 1 (1934), No. 23, pp. II+12, figs. 2*).—In order to determine whether or not the relatively large amounts of copper sometimes occurring in oysters are harmful, feeding experiments over a period of 60 weeks were conducted on rats, using diets containing copper in amounts of 3.86 mg per kilogram (stock diet), 11.3, 179, 527, and 527 mg per kilogram, respectively. The increased copper content of the four experimental diets came from combining 80 percent of the stock diet with 20 percent of white, light green, or green oysters, and 20 percent of white oysters plus $CuSO_4$ to make the same copper content as in the green oysters.

From growth curves and histological examination of the animals on autopsy no evidence of toxicity could be detected even at the highest levels of copper. The copper content of the livers of the animals on the higher doses of copper was somewhat higher than that of the controls but not in proportion to the difference in ingested copper. These results are in agreement with those of Cunningham (E. S. R., 67, p. 340) but not with those of Flinn and Inouye (E. S. R., 62, p. 690) or of Lindow, Peterson, and Steenbock (E. S. R., 62, p. 689), who reported a very much higher concentration of copper in the livers of rats fed additional copper. On repeating the experiments, using the stock diet of Lindow et al., a much higher storage of copper took place. The reason for this difference has not yet been determined.

Evidence was also obtained that excess copper in the diet is very rapidly excreted, with no detectable difference in quantity or in the path of excretion when fed as copper sulfate or in oysters.

Inasmuch as the daily consumption of oysters in the experiments reported would correspond in human beings to about seven average servings, the oysters fed contained from 3 to 900 times the quantity in oysters on the market, and the oysters themselves apparently inhibited the storage of copper in the experimental animals, "it would seem logical to conclude that the copper content of market oysters should cause but little concern."

A list of 24 references is appended.

The excretion of copper in urine and faeces and its relation to the copper content of the diet, S. L. Tompsett (*Biochem. Jour., 28 (1934), No. 6, pp. 2088–2091*).—Using the method described previously (E. S. R., 73, p. 718) with further modifications which are described in detail, the author has conducted copper-balance experiments on 17 persons, of whom 14 had no organic diseases, 2 subacute nephritis, and 1 carcinoma of the stomach. With the exception of this final subject, who was able to take fluids only, the total excretion within the limits of experimental error balanced the intakes. Calculated in terms of volume, the range in content of copper in the urine was from 0.08 to 0.48, with an average of 0.18 mg per liter. The total excretion of copper in the carcinoma patient was 0.63 mg. It is suggested that this may be the minimum amount required per diem to preserve copper equilibrium.

Iron metabolism in infancy: Relation to nutritional anaemia, H. W. Josephs (*Bul. Johns Hopkins Hosp., 55 (1934), No. 4, pp. 259–272, figs. 5*).—The iron metabolism of six normal infants, four starting at from 2 to 3 weeks of age and continuing through the third month, one from the sixth week to the sixth month, and one from the second week to the sixth month, was studied to determine (1) to what extent an infant conserves the iron stores with which it is born and (2) to what extent these stores are required to cover the needs for hemoglobin formation after the second month of life. Iron was determined in the feces by a sodium thiocyanate method which is described in detail. Various calculations were made on the assumption that the blood volume constitutes 7.6 percent of the body weight and that iron constitutes 0.34 percent of the hemoglobin. From these figures and the determinations of the hemoglobin content of the blood, the amount of iron which could be set free from hemoglobin during the period of falling hemoglobin content was determined.

In the first 2 mo. of life the iron balance tended to be slightly negative, after which it became positive, with an approximately constant increase in retention averaging about 6 mg a month. From the calculations based on the data from the six cases studied, it is concluded that the birth stores are required for hemoglobin formation only rarely before the third month, and under normal conditions are probably sufficient to last up to the end of the sixth month. It

was also calculated that an exclusive milk diet cannot cause any great degree of anemia on the basis of its low iron content alone but that other factors causing a disturbance in iron metabolism must be present.

The iodine content of some American fishery products, E. J. Coulson (*U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., 1 (1935), No. 25, pp. II+7*).—Data are reported on the iodine content, as determined by the torch method of Von Kolnitz and Remington noted on page 744, of 12 species of fresh and canned fish, 8 kinds of fishmeal, and 3 fish oils. The values are reported in parts per billion on the fresh and dry basis.

Of the fish tested, the highest values were found in the haddock with an average of 26,100 parts per billion dry basis for 8 samples, and the mullet with an average of 20,490 parts per billion for 2 samples. The average content of 5 samples of codfish was 5,350 parts per billion, and that of canned Chinook salmon was 2,010 parts per billion for 3 samples. All of the other fish and sea food examined had values between 1,000 and 2,000 parts per billion. Of the fishmeals examined, shrimp had the highest value, 23,080, followed by crab 19,440, whitefish 12,080, and menhaden meal 4,500 parts per billion. The other values were between 1,000 and 2,000 parts per billion. The average values for the fish oils were cod-liver oil 7,670, salmon oil 1,980, and sardine oil from Maine 470 and from California 260 parts per billion.

A study of manganese retentions in children, G. J. Everson and A. L. Daniels (*Jour. Nutr., 8 (1934), No. 5, pp. 497–502*).—The manganese balance experiments reported were conducted on 3 girls and 4 boys from 3 to 5 yr. of age, following the same procedures as in a previous study of iron and copper retentions (E. S. R., 73, p. 564). Twelve studies were made at three different levels of manganese ingestion—0.113, 0.158, and 0.307 mg per kilogram of body weight.

The balances were all positive, and within the limits of the study the retentions were proportional to the quantities ingested. The average retentions from lowest to highest intakes were 0.01, 0.031, and 0.059 mg per kilogram of body weight. At the lowest level of intake 92 percent, and at the two higher levels 79 percent of the ingested manganese was excreted in the stools. The amount excreted in the urine, although very small, was proportional to the intake.

The fact that consistently higher retentions were obtained at the higher ingestion levels in children who had received fair amounts of manganese previously is thought to indicate a definite need for this element, which may not be met by diets considered adequate from other standpoints. The requirement for this age group is estimated to be from 0.2 to 0.3 mg per kilogram.

A study of the food habits and physical development of preschool children over a two-year period, with special reference to seasonal variations in growth, H. McKay and M. B. Patton (*Ohio Sta. Bul. 549 (1935), pp. 72, figs. 20*).—This is the complete report of an investigation noted previously from progress reports (E. S. R., 71, p. 724).

The data were collected from January 1932 to January 1934, inclusive. The group studied consisted of 9 normal healthy children from 19 to 40 mo. of age at the beginning of the study, and all from homes above the average in social and economic status. Records were obtained of the food intake of 6 of the children for 1 week in each of the four seasons of the 2 yr., or a total period of 8 weeks, and for the other 3 children for 5, 6, and 7 weeks, respectively. Each child was weighed and measured monthly, with few exceptions necessitated by vacations. Medical and dental examinations were made periodically.

The relationship between total calories and height was found to be more significant than the relationship between total calories and either weight or age, although both were significant. "Calorie intakes of individual children varied to a greater extent from day to day within each week than they did from season to season or from one year to the next. Factors which seemed to influence a child's calorie intake were (1) the food intake itself—that is, the highest calorie intake either followed or preceded the lowest calorie intake in 36 percent of the cases; (2) the type of food served; (3) the onset of colds; (4) excitement and emotional strain; (5) the days of the week, the first part of the week being seemingly more conducive to high calorie intakes than the end of the week; and (6) the season, calorie intakes during summer and autumn being less varied than during other seasons. Suitable food selection for preschool children and control of the environment to prevent emotional states which disturb the daily rhythm of a child's life are important. Further study of influences which cause such wide variations in caloric intake of preschool children might be of value."

The range of distribution of calories among the principal food groups for the 2 yr. separately was as follows: Milk from 32 to 51 and from 34 to 51 percent; cereals 12 to 22 and 12 to 23 percent; fruits and vegetables 13 to 21 and 16 to 26 percent; meat 2 to 9 and 3 to 8 percent; eggs 1 to 7 and 2 to 7 percent; sugar 4 to 12 and 6 to 10 percent; and fat 4 to 16 and 6 to 10 percent. In the percentage of total calories derived from protein, fat, and carbohydrate, the averages for the individual children, as well as for the group, deviated considerably from the Holt standards of protein 15, fat 35, and carbohydrate 50 percent.

The daily protein intakes of the individual children ranged from 30 to 52 g, with an average of 42 g for the entire group in the first year. Corresponding figures for the second year were a range of from 32 to 55 g, with an average of 46 g. The relationship between total protein and height was found to be somewhat more significant than between protein and weight, and there was no significant relationship between protein and age.

The average daily mineral intakes for the first and second years, respectively, were calcium 0.946 and 1.015 g, phosphorus 0.972 and 1.051 g, and iron 7.032 and 7.499 mg. The total calcium showed a significant relationship to height but little if any to age and weight, total phosphorus a relationship to weight and an even more significant relationship to height, and total iron a relationship to age, weight, and height, with weight of greatest significance.

As far as could be calculated from the limited amount of data available, the daily vitamin A intakes ranged from 283 to 485, with an average of 388 units per 100 calories the first year, and from 304 to 505, with an average of 423 units per 100 calories the second year. All values were well above the Rose tentative standard of 200 units per 100 calories. The vitamin B intakes were not so favorable, ranging from 22 to 32, with an average of 27 units per 100 calories both years as compared with the standard of 30 units. The vitamin C values ranged from 80 to 132 units, with an average of 99 units the first year and from 66 to 125, with an average of 104 units the second year, these values being greatly in excess of the tentative standard of 20 units daily. The vitamin G values, for which no standard was available for comparison, ranged from 474 to 679, with an average of 559 units for the first year, and from 512 to 765, with an average of 633 units for the second year. Calculated per 100 calories, the group averages for the 2 yr. were 46 and 49 units.

During each of the 2 yr. all of the children made or exceeded the expected gains in weight of the Woodbury standards, with autumn the season of greatest

gains. In 9 out of the 15 instances, the periods of greatest gains in weight were those of high intakes with regard to calories, protein, phosphorus, and iron per kilogram of body weight and total calcium, phosphorus, and iron. All of the children but one made or exceeded the expected gain in height during the 2-yr. period, with greater increases in winter and spring. No significant relationship could be determined between food intake and periods of low or high gains in weight.

The complete data concerning the quantities of the specific foods used by the individual children during each season of the 2-yr. period are presented in tabular form suitable for analysis by investigators interested in special aspects of the diet.

Basal metabolism in children of normal and of subnormal intelligence, with blood cholesterol and creatinine values, H. B. Rothbart (*Amer. Jour. Diseases Children, 49 (1935), No. 3, pp. 672–688, figs. 6*).—In this investigation, in which the author had the assistance of A. B. Haw, basal metabolism determinations were made on 98 children (comprising 59 boys and 39 girls) in a State institution, and the results, together with blood cholesterol and creatinine values, were compared with the mentality of the subjects, as determined by the Stanford-Binet tests. The intelligence quotients ranged from 60 to 120.

The normal basal rates were calculated from the Harris-Benedict tables for boys and the Talbot tables for girls. As thus calculated, the basal metabolic rate for the boys ranged from −10 to +15 percent and for the girls from −15 to +15 percent. No definite relationship could be observed between the metabolism figures and the intelligence quotients.

The blood cholesterol values for the boys varied between 120 and 170 mg per 100 cc and the girls from 140 to 170 mg. The average for the boys of both normal and subnormal mentality was 153 mg, and for the girls the average was 155 mg for the subnormal and 167 mg per 100 cc for the normal group. The blood creatinine level ranged from 1.2 to 1.6 mg, with an average for the boys of 1.37 mg and for the girls of 1.33 mg per 100 cc. The blood pressure and pulse rate in most instances were in direct proportion to the basal metabolic rate.

The basal metabolism of European women in south India and the effect of change of climate on European and south Indian women, E. D. Mason (*Jour. Nutr., 8 (1934), No. 6, pp. 695–713, figs. 4*).—In this continuation of the investigation of factors which may be responsible for the low metabolism of native women in India (E. S. R., 73, p. 557), the possible effect of climate was studied through basal metabolism experiments on 34 European women whose total length of residence in the Tropics, with the exception of furloughs, ranged from 2½ mo. to 31 yr. For 9 of these women data were obtained in temperate climates shortly before similar determinations in Madras. Three native women were also studied at close intervals in Madras and after going to temperate climates. Other physiological measurements were also taken, including mouth temperature, pulse rate, blood pressure, and vital capacity.

The measurements on the 34 European women residents in Madras showed an average metabolism 7.9, 6.3, and 12.5 percent below the Harris-Benedict, Dreyer, and Aub-Du Bois standards, respectively, and 9, 9.9, and 4.7 percent above the average metabolism of Indian women in Madras. For both European and Indian subjects in Madras, the average mouth temperature was slightly higher and the pulse and blood pressure were as low as or slightly lower than values reported in western countries. The vital capacity of the European women was much higher than that of the Indian women.

The 9 European women studied in both temperate and tropical climates showed two types of response to the Tropics—(1) a marked decrease in metabolism, a fairly marked fall in pulse rate, and no rise in mouth temperature, and (2) no change in metabolism, a slight fall in pulse rate, and a rise in temperature of from 0.2° to 0.7° F. The average decrease in metabolism of the group of 9 on moving to the Tropics was 5.1 percent, while the 3 Indian women on moving to cold climates showed an average increase in metabolism of 4.8 percent.

These findings are thought to suggest an interesting physiological adaptation to the Tropics in that those individuals who are able to lower their heat production avoid a rise of temperature, while those who do not respond to the tropical climate by a decrease in heat production show a rise in temperature. It is suggested that the second type of adjustment may predominate. It is concluded that probably at least 5 percent of the low metabolic level of Indian women may be attributed to the effect of tropical climate. "If the 5 percent correction of standards for women be applied in addition to the correction for climate, there still remains to be explained by factors other than climate a difference between the average metabolism of Indian women and western women of approximately 7 percent."

A study of some physiological effects of ultra-violet irradiations upon normal adults, H. H. Hunt and J. M. Leichsenring (*Radiology, 22 (1934), No. 3, pp. 318–329, figs. 6; abs. in Minnesota Sta. [Bien.] Rpt. 1933–34, p. 60*).—In this contribution from the Minnesota Experiment Station, the literature on the technic of administering ultraviolet irradiation and on studies of the effects of irradiation on various physiological processes and on infections of the upper respiratory tract is reviewed briefly, and a study is reported in which clinical data were noted from week to week throughout the winter months of 1930–31 and 1931–32 for 6 college women receiving periodic treatment with a carbon arc lamp and 6 receiving no treatment. The treatment consisted of sub-erythema doses, the exposures increasing from ½ to 10 min. per side at a distance of 30 in. once a week during the first year and twice a week, with a considerably higher dosage, during the second year. No cod-liver oil or vitamin B concentrate was allowed the members of either group.

The data obtained included total red, total white, and differential blood counts, blood pressure, hemoglobin, temperature, pulse, and respiration. Records were kept of the number and duration of colds and other infections and of appetite and other subjective symptoms of well-being. All of the measurements fluctuated throughout the entire period with no definite response to the irradiation with the possible exception of hemoglobin production, which was increased more noticeably the second year than the first. It has not been determined whether this increase was real or only apparent, due to the temporary mobilization of the hemoglobin reserves of the body.

The number of colds was slightly lower the second year, perhaps as a result of the greater amount of irradiation. There was no manifest effect upon appetite, weight, sleep, or physical efficiency of the group as a whole.

An extensive list of literature references is appended.

The vitamins: Their scientific documentation and practical application, J. G. Dennler (*Las Vitaminas: Su Documentacion cientifica y aplicacion practica. Buenos Aires: Gadola, 1934, pp. XV+126*).—A concise handbook in Spanish.

Studies on the adrenal.—VII, The relation of the adrenal cortical hormone to the vitamins, A. Grollman and W. M. Firor (*Jour. Nutr., 8 (1934), No. 5, pp. 569–582, figs. 5*).—Purified adrenal cortical hormone was found to have no effect as a source of vitamins B, G, or C. The positive results reported

by previous observers concerning the vitamin C activity of adrenal cortical preparations are attributed to the presence of ascorbic acid in incompletely purified extracts. As further evidence of lack of relationship between the adrenal hormone and vitamin C, experiments are reported in which ascorbic acid failed to prolong the life of adrenalectomized rats.

The influence of the solvent on the biological effect of carotene and vitamin A, K. C. Lathbury and G. N. Greenwood (*Biochem. Jour., 28 (1934), No. 5, pp. 1665–1673, figs. 5*).—In continuation of an investigation by the senior author (Culhane) of the influence of the constituents of the basal diet on the determination of vitamin A (E. S. R., 70, p. 422), it was found that the effect of different oils as solvents for the vitamin was much greater than that of any other factor tested. A further study of the different solvents is reported, with the conclusion that not only do different oils vary in their suitability as solvents for carotene and vitamin A, but different samples of the same oil may vary greatly independently of the rate of decomposition of the substance dissolved.

Peanut and coconut oils were first compared. In one experiment the peanut oil proved to be about twice as effective as coconut oil as a solvent for carotene. In tests with a vitamin A concentrate, coconut oil proved superior to peanut oil in one experiment, peanut oil slightly superior to coconut oil and linseed oil better than either in another experiment, and both oils equally effective in still another. A comparison of three different coconut oils showed one to be decidedly inferior to the other two. The addition of quinol as a stabilizing agent was without effect.

In the opinion of the authors the suitability of a particular oil can only be determined biologically, since it is a property independent of the dissolved substance in the oil.

The transmission of vitamin A from parents to young in mammals.—IV, Effect of the liver reserves of the mother on the transmission of vitamin A to the foetal and suckling rat, W. J. Dann (*Biochem. Jour., 28 (1934), No. 6, pp. 2141–2146, fig. 1*).—This continuation of the series noted previously (E. S. R., 73, p. 566) reports a study of the effects of vitamin A reserves of the mother on the amount of the vitamin transmitted to and retained by the young up to the time of weaning, which in the present study was at the age of 18 days to prevent consumption of the mother's diet by the young. As in the previous study, a vitamin A concentrate in different amounts was used to increase the store of the vitamin. In the 38 does tested, the range of storage of vitamin A was from 560 to 73,500 blue units at the end of the experiment.

On arranging the does in groups with definite ranges of vitamin A reserves, the mean liver reserves of the does and of all the young in the groups were as follows: 757 blue units (does) and 8 (young), 2,296 and 10, 6,960 and 12, 13,290 and 28, 28,800 and 29, and 60,900 and 50 blue units, respectively.

Thus the storage in the young, although very small, is roughly proportional to the reserves of the mother. Attention is called to evidence of individual idiosyncrasy in the storage of vitamin A by rats having equal opportunities of obtaining it.

Some studies of nerve degeneration associated with avitaminosis A in the white rat, T. S. Sutton (*Abs. Diss., Ohio State Univ., Columbus, 1934, pp. 241–251, pls. 7*).—The investigation upon which the dissertation abstracted in this report is based has been noted previously (E. S. R., 73, p. 134).

A contribution to the problem of the relationship between the B vitamins and the protein, fat, and carbohydrate contents of food, P. Vogt-

MØLLER (*Bidrag til Spørgsmaalet om Relationen mellem B-Vitaminerne og Ernaeringens Indhold af Protein, Fedt og Kulhydrat. Köbenhavn (Copenhagen): Levin & Munksgaard, 1934, pp. 165, figs. 5; Eng. abs., pp. 149–157*).—This monograph reports an extensive investigation conducted on mice with highly purified diets of the quantitative requirements of vitamin B_1 ($+B_4$) and vitamin B_2 as related to the protein, fat, and carbohydrate content of the diet, with the conclusion that the need for vitamin B_1 ($+B_4$) increases with increase in the carbohydrate content and decreases with increase in the fat content of the diet, and that the need for vitamin B_2 increases with increase in the fat and possibly in the protein content of the diet.

In view of these findings, the necessity is emphasized of feeding experimental animals with diets of uniform composition in comparative studies on the content of these vitamins in food materials.

Investigations on the B vitamins and their relationship to the carbohydrates, proteins, and lipides of the diet [trans. title], R. LECOQ (*Bul. Soc. Sci. Hyg. Aliment., 22 (1934), No. 9–10, pp. 278, 279*).—This is a general review of the literature on the subject, including the investigations of the author and his associates (E. S. R., 72, p. 729).

The sparing action of fat on vitamin B.—VIII, On the loss of vitamin B from the rat's tissues, H. M. EVANS and S. LEPKOVSKY (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 439–445, figs. 2*).—In this continuation of the series of studies noted previously (E. S. R., 73, p. 135), the sparing action of fat on vitamin B was investigated further by determinations of the vitamin B content of various body tissues of growing rats which had been fed on high fat and low fat vitamin B-free diets until those on the low fat diet declined rapidly. For purposes of comparison, litter mates were sacrificed at the beginning of the experiment for determinations of the vitamin B content of their tissues as representing that of the experimental animals at the same time.

The greatest loss in vitamin B occurred in the liver, and about three times as much vitamin B was lost from the livers of rats on the low fat diet as from those on the high fat diet. There was a considerable loss of vitamin B from the muscles of rats on the low fat and practically none on the high fat diet. The losses were also greater on the low fat diet in the brains and adrenals. The vitamin B content of the feces was about the same on the low and high fat diets, indicating that "whatever sparing action fat may have upon the vitamin B content of the rat's tissues, its mechanism is not the prevention of loss of vitamin B in the feces."

The authors conclude that "the mechanism of the sparing action of fat probably lies in the reduction of the vitamin B dissipated in metabolic processes, less vitamin B being consumed and destroyed when high fat diets are fed, so that with the same amount of vitamin B the rat is able to live much longer and to make some growth. It must always be kept in mind, however, that fat by itself will not spare vitamin B, but the cooperative action of high protein and high vitamin G is also necessary. Nor can it be said that this phenomenon is any too well understood, since exact duplication of results is not always possible."

Requirement of the flour beetle (Tribolium confusum Duval) for vitamins in the B group, H. R. STREET and L. S. PALMER (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1500, 1501*).—Experiments are reported briefly showing that the flour beetle, previously used successfully as a test agent for determining the vitamin B complex (E. S. R., 59, p. 593), requires for pupation both vitamin B_1 and a heat-stable factor which is destroyed by autoclaving at pH 13 for 4 hr.

Some effects of the composition of the diet on the vitamin B and the vitamin G requirement of the growing rat, N. B. GUERRANT and R. A. DUTCHER (*Jour. Nutr., 8 (1934), No. 4, pp. 397–420, figs. 8*).—The general plan followed in this investigation at the Pennsylvania Experiment Station was to feed groups of rats diets of varied composition but deficient in both vitamins B and G until early symptoms of vitamin B deficiency appeared, then to supplement the diets with daily doses of a vitamin B concentrate until symptoms of vitamin G deficiency appeared, when the diets were supplemented further with autoclaved yeast and the observations continued for several weeks. The vitamin B supplement was a suitably prepared concentrated extract of dried brewer's yeast and the vitamin G baker's yeast autoclaved in an alkaline medium for 6 hr. at 15 lb. pressure.

Increasing quantities of fat in the diet prolonged the depletion period for vitamin B, but had no effect on that for vitamin G. The most satisfactory growth response (on somewhat restricted intakes of vitamins B and G) occurred when the fat content of the diet ranged from 15 to 20 percent. Increased quantities of mineral salts appeared to increase the requirement for vitamin G and, conversely, decreasing quantities had a sparing effect on vitamin G. Variations in the protein content had no effect on the utilization of either of the vitamins. The requirement of both vitamins appeared to increase when sucrose was fed as the sole source of carbohydrate and to decrease when the sucrose was replaced by dextrin. Increasing amounts of fiber as agar or CellU flour had a definite sparing effect on both of the vitamins. The beneficial effect of the fiber is thought to be due to the production of more favorable conditions for the growth of micro-organisms in the digestive tract.

A method of vitamin assay and its application in a study of the vitamin B and G content of mung beans and the grain sorghums, R. REDER (*Okla. Acad. Sci. Proc. [Okla. Univ.], 14 (1934), pp. 50–52, figs. 2*).—In this contribution from the Oklahoma Experiment Station, a curve of growth response of rats to increasing amounts of vitamin B is given, and a method is described for using this curve to estimate the vitamin B content of a given material by feeding one amount only of the substance (provided the curve of growth response to this amount falls on the straight line portion of the curve of reference).

The basal diet selected after various trials as the most satisfactory for vitamin B and G determinations consists of rice starch 58 percent, casein (acid-washed) 18, Crisco 15, salt mixture 3.5, agar 2, and cod-liver oil 3.5 percent. In the vitamin B tests vitamin G is supplied as 0.5 g daily of autoclaved yeast, and in the vitamin G tests vitamin B is given as an alcoholic extract of rice polishings.

In illustration of the method data are given on the vitamin B and G content of mung beans, kafir, and darso. The amounts of these materials furnishing 1 unit of vitamin B were 0.6, 0.66, and 0.63 g, respectively. The grain sorghums were found to be almost devoid of vitamin G. "Animals receiving 3.5 g of these daily as supplements to the basal G-free diet were unable to gain 3.2 g in 21 days. Mung beans proved to be a better source of vitamin G; 2 g daily supplied sufficient vitamin G to permit an average daily gain of 1.5 g over a period of 21 days."

A comparison of vitamins B and G in canned strained foods, F. HANNING (*Jour. Nutr., 8 (1934), No. 4, pp. 449–456*).—In continuation of the studies on the vitamin content of canned strained foods of a single brand (E. S. R., 71, p. 884), several canned strained vegetables and a canned strained cereal were examined for their vitamin B and G content by the methods of Chase and Sherman and Bourquin and Sherman, in both cases using the rat harness as described

by Page (E. S. R., 69, p. 469) for preventing coprophagy. Canned strained tomatoes were found to contain from 20 to 24 units of vitamin B and 6.7 units of vitamin G per ounce, peas from 7 to 8 units of vitamin B and from 7.5 to 8.6 units of vitamin G, carrots 4.3 units of vitamin B and 2.5 units of vitamin G, beets 3.3 units of each vitamin, green beans 4.7 units of vitamin B and 6 units of vitamin G, and spinach about 2.5 units of vitamin B and from 7.5 to 11.8 units of vitamin G per ounce. The canned strained cereal tested contained 7.5 units of vitamin B and 12 units of vitamin G and a canned vegetable soup 3 units of each vitamin per ounce.

Irradiated vitamin B complex and dermatitis, A. G. Hogan and L. C. Richardson (*Jour. Nutr., 8 (1934), No. 4, pp. 385–396, fig. 1*).—This contribution from the Missouri Experiment Station describes the technic now used by the authors in destroying the dermatitis-preventive factor in the vitamin B complex by irradiation, and demonstrating this destruction by feeding experiments on rats (E. S. R., 69, p. 152).

As a result of studies of the various constituents of the ration as employed, the only change made was in the substitution of commercial sucrose for the recrystallized preparation. Cornstarch did not prove a satisfactory substitute, for, although it did not enable the rats to resume growth, it did cure the dermatitis. When 13 percent of fat as hydrogenated cottonseed oil, milk fat, or lard was substituted for an equal amount of sucrose, the results were less consistent. In tests of various vitamin B-containing materials, the most consistent and satisfactory results were obtained with dried yeast.

Approximately 75 percent of the dermatitis-preventive factor was destroyed by irradiation following the technic described. The degree of destruction of the antineuritic factor in dried yeast by the irradiation has not been determined, but it is thought not to be sufficient to interfere with the method.

The relationship of dermatitis in chicks to lack of vitamin B_2 and to dietary egg-white, J. G. Lease and H. T. Parsons (*Biochem. Jour., 28 (1934), No. 6, pp. 2109–2115, pl. 1, fig. 1*).—In this continuation of the reports on the extensive investigation of egg white dermatitis (E. S. R., 73, p. 572), the literature on the possible relationship between this condition and the dermatitis caused by lack of vitamin B_2 is reviewed briefly, and an experiment designed to throw further light on the subject is described in which the pellagralike symptoms were produced in chicks by feeding rations low in vitamin B_2 and rich in egg white, respectively. With each group the curative effect was then tested of both the Lilly liver extract No. 343, known to be rich in vitamin B_2, and the residue left in the process of preparing this extract. This residue is lacking in vitamin B_2 but rich in the factor protective against egg white.

The dermatitis caused by the egg white was cured by the liver residue but not by the Lilly liver extract No. 343, and the opposite was true in the case of the dermatitis caused by the liver residue. It is concluded that the egg white syndrome is not due to the vitamin B_2 deficiency, although the symptoms are strikingly alike.

In discussing the significance of these results, it is pointed out that the hypothesis that the toxic effect of egg white is due to a destructive action of the egg white on vitamin B_2 or on a possible protective factor not identical with vitamin B_2 has been proved untenable, and that unpublished observations have not substantiated the alternative hypothesis of a failure of vitamin B_2 of the diet to reach the blood stream due to some inhibiting effect of the egg white in the digestive tract.

Inanition as a factor in vitamin G deficiency, D. G. Remp and F. C. Bing (*Jour. Nutr., 8 (1934), No. 4, pp. 457–462*).—A comparison is reported of the

growth, food consumption, and composition of the blood and femurs of mice kept for 6 weeks, starting at the age of 3 weeks, on a vitamin G-deficient diet and a normal diet with intake restricted to that of the animals on the G-deficient diet. The mice on the G-deficient diet consumed approximately 60 percent of the caloric intake of others fed a complete diet ad libitum. "In both caloric-deficient and G-deficient mice the body weight remains approximately constant, the neutral fat almost disappears from the body, the total phospholipide content remains unchanged, and the bones continue to grow at a subnormal rate. The number of red blood cells and the concentration of hemoglobin and of serum protein are slightly lower in stunted mice than in normal animals of the same age. Inanition is thus a significant feature of the syndrome of vitamin G deficiency. Both vitamins B and G are required for the maintenance of the normal appetite."

A method for the quantitative determination of ascorbic acid (vitamin C).—The vitamin C content of various plant and animal tissues, H. TAUBER and I. S. KLEINER (*Jour. Biol. Chem., 108 (1935), No. 2, pp. 563–570*).—The new method described depends upon the rapid reduction at comparatively low temperatures of an acid ferricyanide solution by ascorbic acid, and the determination of the quantity of reduced ferricyanide according to the Folin and Malmros procedure of treating the solution with ferric gum ghatti reagent and determining the prussian blue thus formed colorimetrically. In carrying out the test, all possible interfering substances are removed according to the method of Emmerie and Van Eekelen previously noted (E. S. R., 73, p. 583).

The preparation of the reagents and the technic followed in the test are given in detail, and data are reported on the ascorbic acid content and recovery of added ascorbic acid of normal urine, as determined by the Tillmans method and the new method after mercury precipitation in both cases, and on the ascorbic acid content, as determined by both methods, of a number of plant tissues and of normal rabbit and guinea pig tissues without mercury precipitation, and of a few plant materials after removal of interfering substances and pigments. The agreement between the two methods is shown to be closer after removal of interfering substances.

In commenting upon the fact that the new method was checked only by the titration method and not by biological assays, the statement is made that the new method, like the titration method, is presumably more accurate than the animal method because of its sensitivity to small variations. "It is probable, however, that certain substances may be encountered in natural or processed foods which might reduce the ferricyanide under these conditions and not have antiscorbutic properties. Therefore, in certain doubtful instances confirmation with animal experiments may be necessary." Among the materials tested are the greens and roots of beets, parsley, parsnips, and turnips. In each case the greens were very much higher in ascorbic acid than the roots.

The biological and titrimetric determination of vitamin C, H. LUND, B. SPUR, and L. S. FRIDERICIA (*Biochem. Jour., 28 (1934), No. 5, pp. 1825–1828*).—In this comparison the vitamin C content of lemon juice, an extract of dried rose hips, and ascorbic acid was determined biologically by the Höjer method, using the Key and Elphick scale (E. S. R., 67, p. 189), and titrimetrically with 2,6-dichlorophenolindophenol, following the technic of Tillmans et al. (E. S. R., 69, p. 8) but with a somewhat stronger indicator solution on account of the relatively high vitamin C potency of the hip extract and lemon juice. Protective experiments were used in the biological test, and in order to insure that the guinea pigs at the beginning of the experiment were without latent scurvy and at the same time without significant stores of vitamin C, the

animals were fed for 3 weeks on the Key and Elphick vitamin C-free diet, with a daily addition of 50 mg dried rose hips.

In the biological test, from 1.25 to 1.5 cc lemon juice, 50 mg dried hips, and 0.7 mg ascorbic acid were equivalent, these doses being just sufficient to preserve normal tooth structure. According to these figures, the lemon juice tested contained from 0.4 to 0.6 mg ascorbic acid per cubic centimeter and the dried hips 1.4 percent ascorbic acid. In the titration tests the hips gave a value of 1.2 percent ascorbic acid and the lemon juice 0.39 and 0.56 mg per cubic centimeter for two different shipments of lemons, the one giving the higher value being considerably riper than the other.

The selective localization of ascorbic acid or vitamin C (adrenal cortex, testicle, corpus luteum, hypophysis) [trans. title], A. GIROUD and C. P. LEBLOND (*Arch. Anat. Micros., 31 (1935), No. 1, pp. 111–142, figs. 18*).—The distribution of ascorbic acid in various organs is discussed, with references to the literature and to the authors' studies, several of which have been noted (E. S. R., 73, p. 426).

The various organs discussed are classified according to their content of ascorbic acid as follows: (1) Those containing too little of the vitamin to give any test—thyroid, thymus, pancreas, salivary glands, stomach, muscle tissues, and conjunctival tissues and their derivatives; (2) those containing a sufficient quantity of the vitamin to give slight tests, often irregular or variable—intestines, liver, and kidney; and (3) organs rich in the vitamin—the adrenal cortex, corpus luteum, interstitial tissues of the testicle, and glandular lobe of the hypophysis. The fact that these tissues, particularly the first three, have a series of very similar morphological and chemical characteristics is thought to point to common functional properties.

Distribution and evolution of vitamin C in the organism [trans. title], A. GIROUD and C. P. LEBLOND (*Presse Méd. [Paris], 43 (1935), No. 54, pp. 1085–1087, figs. 3*).—Essentially noted above.

Is the ascorbic acid content of the suprarenals and liver under the control of the nervous system? A. B. L. BEZNÁK and Z. HARISS (*Biochem. Jour., 28 (1934), No. 6, pp. 2039–2043*).—No changes could be demonstrated in the ascorbic acid content of the adrenals of cats and of the livers of guinea pigs during stimulation or degenerative section of the splanchnic nerve or as a result of perfusion of these organs with adrenalin or acetylcholine in Ringer solution. It is concluded that "the ascorbic acid contents of the different organs and the transport of ascorbic acid in the organism are not under the control of the nervous system, and that neither the suprarenals nor the liver act as a store for vitamin C."

The efficacy of vitamin D administration in aqueous preparation, Y. VENAR and T. W. TODD (*Jour. Nutr., 8 (1934), No. 5, pp. 553–568, figs. 4*).—This paper reports a series of experiments arranged to determine the efficacy of aqueous preparations of vitamin D on bone development in rats on a diet deficient in calcium as well as phosphorus. The diet consisted of dried yellow corn 76, wheat gluten 20, talcum purificatum 3, and sodium chloride 1 percent. The aqueous preparations of vitamin D were of two types, one consisting of the fraction of activated ergosterol in oil soluble in water and the other a water solution of crystalline activated ergosterol. In addition suspensions in water of the residue of the activated ergosterol in oil after the extraction of the water-soluble material and oil dilutions of the activated ergosterol were used for comparison.

Young rats at weaning were fed the mineral-deficient diet without supplements for initial periods of varying duration and were then given the test material through special pipettes for stated times, after which they were killed for histological examination of a longitudinally split femur and for ash analysis of the bones after fat extraction.

The aqueous preparations proved capable of restoring an approximately normal healthy appearance of the growth area of the bones in spite of the severe pathological disturbances induced by the deficient diet. If the velocity of growth was not too greatly out of proportion to the available minerals, the skeleton ash percentage in the animals receiving treatment was also maintained, while that of the negative controls showed a progressive decrease. Restoration of the normal pattern of the bones began as early as the fourth day of the treatment and reached its maximum on the ninth day. After this there was a progressive skeletal demineralization in spite of the continued maintenance of normal histological structure in the growth area.

"It is therefore apparent that restitution of the normal morphology in the growth area and replenishment of skeletal mineral depots are two separate though usually closely related phenomena."

Human milk studies.—XVI, Vitamin D potency as influenced by supplementing the diet of the mother during pregnancy and lactation with cow's milk fortified with a concentrate of cod liver oil (a test on rachitic infants and rats), D. J. Barnes, F. Cope, H. A. Hunscher, and I. G. Macy (*Jour. Nutr., 8 (1934), No. 6, pp. 647–657, pls. 4*).—In continuation of the investigation noted previously (E. S. R., 72, p. 871), a woman whose normal milk flow was large and whose diet through two former reproductive cycles was adequate, according to accepted dietary standards, supplemented her diet from the nineteenth week of pregnacy to the end of the lactation period with 2 qt. daily of milk fortified with a cod-liver oil concentrate furnishing a total of 300 units of vitamin D daily. Three colored breast-fed infants who had developed severe clinical rickets, as shown by X-ray examinations and determinations of blood calcium and phosphorus, were given 30 to 32 oz. daily of the milk for periods varying from 11 to 43 days. Periodic X-ray and blood studies of these infants and of the breast-fed infant of the woman furnishing the milk showed no improvement in the rachitic infants but complete protection in the breast-fed control. The ineffectiveness of the milk alone as an antirachitic agent was further demonstrated by the failure of curative tests on rachitic rats. When the same concentrate of vitamin D was given to the infants directly in a cow's milk formula, healing of the rickets began in less than a month and was complete in 2 mo.

The protection of the infant receiving the breast milk from its mother is thought to be due partly to a transfer of vitamin D through the placenta and perhaps even more to the more favorable provision for bone growth furnished by the superior mineral metabolism of the mother. "Exclusive of the advantage to the mother and her own infant, direct administration of vitamin D to the rachitic infant is more effective than the indirect method via breast milk. Of preeminence is the fact that the infant whose mother's diet was known to be superior, not only in vitamin D but in minerals and proteins of excellent quality during both pregnancy and lactation, was able to build normal bone up to the eighth month of life with no direct administration of vitamin D."

Hypervitaminosis D rickets: The action of vitamin D, A. W. Ham and M. D. Lewis (*Brit. Jour. Expt. Path., 15 (1934), No. 4, pp. 228–234, figs. 4*).—Pro-

longed and excessive feeding of vitamin D (1 or 2 drops of irradiated ergosterol, 10,000 X per day) to 7 young rats not only prevented calcification from progressing in a normal fashion, as shown by the 7 controls, but also resulted in the development in the long bones of a condition very similar histologically to the high phosphorus, low calcium form of rickets.

"The phenomena observed in this experiment can best be explained, it is thought, by the theory which considers vitamin D to act by increasing in some way the attraction of the blood for calcium. The results are compatible with, although they do not directly support, the theory that vitamin D acts through the intermediary of the parathyroid mechanism to control a fraction of the serum calcium."

Variability in the activity of the calcifying mechanism in the bones of rachitic rats, A. H. Rosenheim (*Biochem. Jour., 28 (1934), No. 2, pp. 708–711, pl. 1, fig. 1*).—The calcifying property of the cartilage in the bones of rachitic rats has been found to vary directly with the rate of growth of the animals over a 3- to 4-week period on a rachitic diet (McCollum 3143) and to decrease as the period on the diet is increased.

These results are thought to be "not inconsistent with the view that the observed variations in the calcifying power of the cartilage may, like those in the growth rate, be a result of differences in the vitamin reserves of the animals. Although it is held on good grounds that changes in the composition of the blood are primarily responsible for the deficient calcification in rickets, it is difficult to avoid the conclusion that changes in the calcifying power of the cartilage may also play a part in the story."

The seasonal variation in the antirachitic effectiveness of sunshine, H. J. Sloan (*Jour. Nutr., 8 (1934), No. 6, pp. 731–749*).—This paper reports an investigation at the [New York] Cornell Experiment Station of the amount of antirachitically effective ultraviolet rays in sunshine at different seasons of the year at Ithaca, N. Y., and thus in the Great Lakes storm-belt area, a region with much less sunshine, particularly in the winter season, than in the remainder of the United States except the extreme Northwest.

The methods followed were similar to those of Tisdall and Brown in an earlier study of the antirachitic effect of sunshine at Toronto, Canada (E. S. R., 58, p. 495), except that chicks were used instead of rats and the exposures to sunlight were made behind Corex-G980A glass instead of in the open air. During a part of the time an attempt was made to measure by chemical and physical means the antirachitically effective rays present in the sunshine, but the results by this method were unsatisfactory. The first three experiments of 12 weeks' duration each began at the December and June solstices and the March equinox of 1927–28, and the second series of three were centered at these dates in 1928–29. The diets were slightly different in the two series, the second containing less calcium and phosphorus and consequently being more strongly rickets-producing than the first.

In the first series the minimum daily exposure to sunshine required to prevent the development of rickets under the conditions of the experiment was approximately 30 min. in winter, 5 min. in spring, and 2.5 min. in summer. Corresponding periods in the second series were 40, 10, and 5 min., respectively. Calculated in terms of the 21-yr. average of sunshine in the locality, the winter-spring-summer effectiveness of an average year was 1 : 5.3 : 9.3 as based on the 1927–28 results and 1 : 5.9 : 8.1 on the 1928–29 results. "Since Ithaca, N. Y., is in one of the two areas in the United States with least amount of sunshine,

it is probable that the results obtained in this experimental work are an expression of the minimum antirachitic effectiveness of sunshine in the United States rather than an expression of the average or maximum effect."

The increase in antirachitic effectiveness of spring sunshine as compared to winter sunshine is thought to be caused largely by an increase in intensity rather than in the amount of sunshine, while the increase in effectiveness of summer sunshine as compared to winter sunshine appeared to be due about equally to increase in intensity and in amount of sunshine.

The influence of body weight and the administration of cod liver oil on industrial absenteeism, A. D. Holmes and M. G. Pigott (*Jour. Amer. Dietet. Assoc., 10 (1934), No. 3, pp. 208–216*).—In an extensive investigation carried on in a large industrial plant during the winter months of three successive years according to the same general plan as in earlier studies (E. S. R., 69, p. 149), the average percentage of "lost time" of subjects receiving 5 tablespoonfuls of cod-liver oil a week during the entire period was 1.1 percent, while that of the control subjects was 3.1 percent. This difference in hours of absence, considered on a 40-hr. week and a $20 wage basis, was calculated to amount to $7,930 for the entire period.

Among the control subjects, the lowest percentage of absence was for the group slightly below ideal weight and among the cod-liver oil subjects for the group slightly above ideal weight. This is thought to indicate that industrial workers of approximately average body weight have fewer hours of absence than those who are excessively overweight or underweight.

New aspects of deficiencies in nutrition, D. Hunter (*Lancet [London], 1935, I, No. 18, pp. 1025–1032*).—This review of recent developments is presented under the headings: Rickets and osteomalacia, aphosphorosis and osteomalacia in animals, xerophthalmia, beriberi, pellagra, scurvy, endemic goiter, nutritional anemias of infants, idiopathic hyperchromic anemia, pernicious anemia, anemia following gastric operations, and idiopathic steatorrhea (Gee's disease)

Investigations on the nature of haemopoietin, the anti-anaemic substance in hog's stomach.—II, The production of a thermostable haemopoietically active substance similar to or identical with the anti-anaemic principle of liver by the action of the thermolabile haemopoietin on beef, L. Klein and J. F. Wilkinson (*Biochem. Jour., 28 (1934), No. 5, pp. 1684–1692*).—In continuation of the series of papers noted previously (E. S. R., 71, p. 140), further experiments are reported demonstrating the formation of a substance similar to, if not identical with, the active principle of liver by the action of hemopoietin on beef, and the possible relationship between the two antianemic principles is discussed from the authors' experience and from reports in the literature.

It is emphasized that although liver preparations can be administered by intramuscular or intravenous injection since they can be freed from proteins and blood pressure depressants without impairing their hemopoietic action, stomach preparations containing hemopoietin can be given only by mouth, as it has not been found possible to remove proteins from them without removing the associated hemopoietin. The experiments reported include the preparation of active fractions from hog stomach, their incubation with beef, and the testing of the active principle thus formed orally and by injection in pernicious anemia patients.

In discussing the reaction intrinsic factor or hemopoietin (stomach preparation)+extrinsic factor (unknown factor in beef muscle)=liver active principle, it is stated that since the reaction cannot occur in cases of pernicious

anemia owing to the absence of hemopoietin, the liver in such cases must be deficient in the antianemic factor except in active remissions when, after treatment with suitable liver or stomach preparations, the active principle is stored in the liver.

Prophylaxis of simple anemia in infancy with iron and copper: Effect on hemoglobin, weight, and resistance to infection, S. J. USHER, P. N. MACDERMOT, and E. LOZINSKI (*Amer. Jour. Diseases Children, 49 (1935), No. 3, pp. 642–657, figs. 7*).—In this investigation the primary objects were to obtain statistical proof of (1) any condition of ill health resulting from the so-called "simple anemia" in infancy and (2) any improvement in health and in resistance to infections brought about by the addition to the diet of an iron salt, with or without copper. The investigation was carried out on 233 infants from under 2 mo. to over 8 mo. of age in a large institution for foundlings. The infants were assigned by rotation to three groups. One, serving as control, received no medication, another ferric glycerophosphate in doses furnishing from 1½ to 3 grains of iron daily, and a third the same dosage of iron supplemented with from $\frac{1}{40}$ to $\frac{1}{32}$ grain of copper sulfate daily.

In the control group the hemoglobin values fell sharply from the high level at birth to approximately 12.2 g per 100 cc at the age of from 2 to 3 mo., rose slightly at the age of 5 mo., and then fell slowly to an average level of 11.2 g per 100 cc at the age of 1 yr. The infants receiving iron in the amounts indicated showed at the age of 1 yr. an average hemoglobin value 15 percent higher, and those receiving iron and copper a value 19 percent higher than the controls. At the ages of from 8 to 10 mo. and from 12 to 14 mo., the average weight of the group receiving iron was slightly less, and that of the group receiving iron and copper from 8 to 12 oz. more, than that of the control group.

In incidence and severity of infections the infants receiving iron showed only a slight, and those with iron and copper a more definite, change over the control group. The mortality in the control group was 14.5 percent, in the iron group 11.6, and in the iron and copper group 6.3 percent. The difference in the mortality rate was greatest among the infants with whooping cough. Of 29 of these children in the control group and 23 in the iron group, 5 each died, while of 32 infants contracting whooping cough in the iron-copper group only 1 died. In the cases of infants who died, no relationship could be demonstrated between age and the amount of iron and copper per kilogram of liver or the total amount of iron in the liver. This was true of all three groups.

TEXTILES AND CLOTHING

Selection, care, and wearing qualities of women's silk hosiery, J. E. RICHARDSON and V. BAKER (*Montana Sta. Bul. 299 (1935), pp. 75, figs. 14*).—This publication includes general facts about silk hosiery with which purchasers should be familiar; the results of a survey on the selection and care of silk hosiery by Montana women, and of laboratory and wearing tests on 8 of the most commonly worn brands; a discussion, based upon these tests, of factors affecting the wearing qualities and of price with relation to wearing quality; a number of general suggestions on the selection and care of silk hosiery, wearing records for each brand of hosiery tested tabulated by brand and by individual wearers; and a list of 42 references to the literature.

The 250 women interviewed comprised 54 college students, 26 clerks, 28 teachers, 100 town women, and 42 rural women. The number of pairs of silk hosiery purchased yearly by these women ranged from 0 to 44, with an

expenditure of from $9 to $45 at the time of the survey when prices ranged from $1.50 to $1.95. Most of the women purchased more than one weight of hosiery, such as service or semiservice and chiffon. Students, clerks, and teachers bought chiffon weight more generally than town and rural women. In the selection of the hosiery the greatest consideration was claimed for wearing quality by clerks, teachers, and town women, while students and rural women were influenced to a greater degree by advertisements. In construction details considered on purchase, the chief attention was given to material, shape, and length of leg.

In the laboratory and wearing tests, 4 service, 7 semiservice, and 3 chiffon weight samples, representing in all 8 brands, were selected, with 1 brand of artificial silk and 1 of cotton lisle for comparison. The laboratory tests included the usual textile tests and examination of construction details. As the type of wear first experienced by the majority of women as reported in the survey was hole in the heel or, more specifically, the high splice above the heel, special attention was given in the laboratory tests to the construction of the high splice in the various samples and to its resistance to wear as determined by the use of a special abrasion machine designed and constructed by R. T. Challender. This machine is described and illustrated. There were great variations in the wear by abrasion of samples in the same weight group as judged by the number of abrasion strokes required to wear out the high splice. In 4 service-weight samples the range was from 3,252 to 12,576, in 7 semiservice from 2,812 to 11,204, and in 3 chiffon from 2,806 to 7,765 strokes. The service weight artificial silk sample gave a value of 11,030 and the all-cotton sample 53,155. The samples giving the lowest values were those in which the heels were reinforced with silk.

For the actual wearing tests, plans were carefully developed and followed for distributing and laundering the hosiery and inspecting it for wear. The wearing records were studied with relation to a number of factors, including walking habits, distance walked, weight of wearer, fit and type of shoe, size of hosiery, degree of foot perspiration, and frequency of laundering the hosiery. With due allowance for these factors, the wearing qualities of the hosiery with respect to construction were considered to be affected chiefly by three factors—number of threads in the yarn, twists per inch in the yarn, and, as noted above, composition of the high splice. Price did not prove to be a good criterion for judging wearing quality, for the additional silk in the higher priced samples decreased the wearing quality.

The final suggestions on the selection and care of silk hosiery are to consider the weight or thread number, look for evidences of twist in the silk yarn, examine reinforcement of high splice, see whether hose are "firsts" or "irregulars", buy those of correct size and suitable length, judge hose by wearing quality and not price, and prolong the wearing life by using correctly fitted shoes, by laundering the hose frequently, and by handling carefully to prevent snags and runs.

HOME MANAGEMENT AND EQUIPMENT

The relative economy of household production and of purchase of white bread, M. MUSE and M. I. LISTON (*Vermont Sta. Bul. 392 (1935), pp. 39, figs. 2*).—In an attempt to learn what economic contribution, if any, can be made to the income of Vermont farm families by the household production of white loaf bread, information concerning bread consumption habits and the time and money costs of home baking was secured from 40 Vermont farm households located from ⅛ mile to 8 miles from five market centers varying in size from a

very small village with one store carrying one brand of bread to a city of 25,000 population with a wide range of marketing facilities. In addition to these marketing centers, bread was available from trucks to 90 percent of the homes during the summer months and 75 percent during the entire year.

Of the 40 households, 12 were classified as of limited income, 15 as of moderate income, and 13 as relatively prosperous. Time records kept for a week showed that the average time given to household tasks by the homemakers was about 8 hr. and by her helpers about 2 hr. per day. About half of the entire time was given to preparation and clearing of the meals.

During the 4 weeks of the study, the per capita consumption of bread averaged 9.5 lb., with a range of from 4.09 to 19.25 lb. Of the 40 households, 55 percent baked most, 12 percent bought most, and 33 percent bought all of their bread. The reason most frequently given for baking at home was economy. Preference for home-made bread and belief that it was more nourishing than purchased bread were also mentioned. The most common reason given for buying bread was convenience, with preference and economy also mentioned.

The cost of the household production of white bread was studied for 57 bakings in 19 of the homes. The methods and difficulties of determining these costs are discussed in considerable detail. The median money costs for ingredients and fuel are calculated to be 4.3 ct. per pound, the median time 6.3 min. per pound, and the median weight of the single baking 7.7 lb. A total of 32 branded and 7 home bakery breads was available for purchase at an average cost for both of 7.8 ct. per pound. Had the 40 households purchased all of the bread consumed in the 4 weeks, the average cost per household would have been $4.01 as compared with $2.21 for the same amount of bread made at home. The money saving through the household production of bread would thus amount to $23.40 in 1 yr.

To compare the quality of the home-made and purchased breads, chemical composition and energy values of the three classes (home-made, home bakery, and branded) were determined, and duplicate samples were scored by three home economics trained judges who were not aware of the identity and source of the samples tested. The three types of bread were quite similar in composition. The greatest variations were in fat and ash content, the commercial samples containing considerably less fat and more ash than the home-made samples. The latter had higher moisture and lower protein content, with the result that there were no significant differences in the calorie values of the three classes. The average quality scores were branded 70.81, home bakery 60.96, and home-made 55.32. The branded breads were better in all of the quality factors than either of the other classes and the home bakery samples higher than the home-made in all factors except crust. A series of experimental bakings, with ingredients similar to those used most frequently in the cooperating households, showed that it was possible to make a bread scoring higher than any of the samples tested. The basic recipe and procedure developed are given in detail.

In discussing the significance of the data obtained, the authors conclude that "decisions as to the desirability of home production of bread should be made by individual households taking into account the monetary return, the pressure which the purchase of necessary or desirable goods and services places upon the cash income, the quality of bread which can be made, and the available time of the homemaker and her helpers."

MISCELLANEOUS

Forty-seventh Annual Report of [Kentucky Station], 1934, I. T. P. Cooper (*Kentucky Sta. Rpt. 1934, pt. 1, pp. 67*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Forty-first Report [of Minnesota Station], 1933–34, A. Boss (*Minnesota Sta.* [*Bien.*] *Rpt. 1933–34, pp. 133*).—In addition to data noted previously or elsewhere in this issue, this report contains abstracts of the following: Some Observations on Chitin-Destroying Bacteria, by D. E. Johnson (p. 23); A Study of the Toxic Action of Coal-Tar Creosote, with Special Reference to the Existence of a Barren Nontoxic Oil, by H. Schmitz (p. 24); The Value of Ordinary Field Practices in Determining the Adaptability of New Potato Seedlings, by A. G. Tolaas (p. 25); The Effect of Temperature and of the Inclusion of Dry Skimmilk upon the Properties of Doughs as Measured with the Farinograph, by O. Skovholt and C. H. Bailey (pp. 32, 33); Five Cases of *Hypertrichosis partialis* in Swine (p. 37) and Dissecting Aneurysms in Swine: A Report of Two Cases (p. 37), both by H. C. H. Kernkamp; Can Mold Spores Survive the Baking Process? by O. Skovholt and C. H. Bailey (pp. 38, 39); A New Name for *Mutilla dimidiata* Lepeletier, with a Redescription of the Type Specimen (p. 40) and The Mutillidea of Formosa [Taiwan] (pp. 40, 41), both by C. E. Mickel; Utilization of Tractor Power on Minnesota Farms, by A. J. Schwantes and J. B. Torrance (p. 44); A New Species and Subspecies of Mutillidae from the Orient, by C. E. Mickel (p. 46); Conditions for Successful Frozen Storage of Fruits and Vegetables—Frozen Muskmelon and Rhubarb Juice, by R. B. Harvey (p. 48); The Toxicity to Wood-Destroying Fungi of Coal-Tar Creosote-Petroleum and Coal-Tar Creosote-Coal-Tar Mixtures, by H. Schmitz (p. 49); Bark Beetle Control in Minnesota, by L. W. Orr (pp. 58, 59); Relative Baking Qualities of Commercially and Experimentally Milled Flour, by M. G. Markley and C. H. Bailey (pp. 60, 61); Canker Worms, by A. G. Ruggles (p. 81); Liquid Milks as Economical Poultry Feeds, by A. C. Smith (p. 82); and Losses in Cooking Meats for Quantity Service, by A. M. Child (p. 83).

Annual summary of publications, B. C. Pittman (*Utah Sta. Circ. 107* (*1935*), *pp.* [4]).—Abstracts of Bulletins 250–256 and Circulars 105 and 106 are given, with lists of reprints and leaflets.

Rothamsted Experimental Station report for 1934 (*Rothamsted Expt. Sta., Harpenden, Rpt. 1934, pp. 259, fig. 1*).—This is a summarized account of the activities of the year.

NOTES

Arizona University and Station.—An $800,000 university building program is being financed by PWA funds. On its completion much space now occupied by other departments in the agricultural building will be freed for the use of the College of Agriculture. Five new buildings are also planned for the university farm.

A department of agricultural economics and rural sociology has been established in the station, with Dr. George W. Barr as agricultural economist and Dr. E. D. Tetreau as rural sociologist. Robert H. Hilgeman, assistant horticulturist at the Tempe Substation, has resigned to accept a position with the State fruit and vegetable standardization service and has been succeeded by Justin G. Smith. Edith M. Lantz, assistant chemist in the station department of human nutrition has resigned to accept a similar position in the New Mexico Station and has been succeeded by Dr. Louise Otis. Dr. Robert A. Greene, assistant professor of bacteriology and assistant agricultural chemist, is to devote half of his time to the directorship of the laboratory connected with the State Department of Public Health.

Arkansas Station.—A 2-unit greenhouse, 32 by 107 ft., with a native stone base, semi-iron frame, and connecting passageways, is nearing completion, partly by the use of labor furnished by the Federal Emergency Relief Administration. The departments of entomology, plant pathology, agronomy, and horticulture will have space in these new units for research.

Over 2,000 of the older 4-H Club boys and girls in the State visited the main station and three branch stations early in September. The visiting days were held in series, with county assignments for certain days during the week. The programs were study programs and given in order to afford a fuller understanding of the problems being attacked by the research staff. The visiting days are to be annual events in the future as a part of the regular county program.

Connecticut College.—Dr. Albert N. Jorgensen of the University of Buffalo has been appointed president.

Idaho University and Station.—A well-isolated apple orchard of 5 acres has been secured near Parma for an extended study in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine of the efficacy of parasites of apple insects as a substitute for sprays. The objective is the elimination of the cost of spraying and spray removal. Should the undertaking prove successful, it is planned to use the orchard as a nucleus for parasite introductions into commercial orchards of the State.

Recent appointments include Alexander Joss as instructor and research assistant in agricultural economics; G. O. Baker, instructor and assistant in soils in the Washington College and Station, as instructor in soils and soil technologist; and L. A. Schade as assistant in plant pathology and assistant plant pathologist.

Iowa College and Station.—The college alumni association has leased to the station for 12 years a farm which it has recently purchased. The intent is eventually to deed the farm to the institution, to which it is readily accessible.

Construction of a new dairy barn to replace the one destroyed by fire in August is expected to be well under way in the near future. The new structure, to cost approximately $40,000, will accommodate 74 cows. Features of the barn include a 4-stall combine milker, a section for experimental cows, and additional feed room.

P. S. Shearer has been made head of the college and station animal husbandry work, and Dr. T. W. Schultz head of that in agricultural economics. Dr. Margaret A. Ohlson of the Michigan College has been appointed associate professor of foods and nutrition. Dr. Lorenzo A. Richards, recently appointed to the staff of the college physics department, has also been made a part-time research assistant professor in the soils subsection of the station for work in soil physics.

Kansas College and Station.—Dr. J. T. Willard has been released from other duties to become college historian on January 1, 1936, and will be succeeded as vice president by Dr. Samuel A. Nock. The vacancy created by the resignation of F. L. Timmons, assistant professor of farm crops and assistant in cooperative experiments, has been filled by the appointment of F. G. Parsons.

Maryland University.—Dr. T. B. Manny, acting head of the Division of Farm Population and Rural Life, U. S. D. A. Bureau of Agricultural Economics, has been appointed head of the department of rural sociology and public welfare.

Missouri Station.—The field crops department has found it possible to combine winter barley, oats, or wheat with either Korean lespedeza or soybeans in annual rotations. The plan yields both grain and legume forage and keeps the ground covered almost continuously. The system is favorable to soil fertility, while the cost of producing the rotation is comparatively low.

Nevada Station.—One of the new lines of work recently undertaken is that of classifying the irrigated lands of the State. Work has been in progress along the Truckee and Carson Rivers and on the Newlands Reclamation Project, and when these areas are completed classification of the lands along the Humboldt River will be undertaken. The basis of grading is largely upon the productive capacity of the land as judged by known yields, depth, texture, and tilth of the soil, presence or absence of hardpan and alkali, topography, capacity for improvement, length of life under irrigation, and related factors. Base maps covering much of the irrigated land of the State have been prepared upon which the land classes are to be shown.

The land classification work is to be followed by a classification of the irrigation water supplies. In this case the classes are to be based upon priority of use, quantity and quality of water available for use, length of time water is available in relation to the length of the irrigation season, and number of years of water shortage in each 10-yr. period.

A broadcast has been arranged by the department of meteorology on snow cover conditions over the western United States. The data are gathered for streams heading in the Continental Divide as well as for the streams of the Great Basin and Pacific coast, through cooperation of Federal, State, and private agencies. The broadcast will be given monthly throughout the winter by the Western Radio Service Unit of the U. S. D. A. Office of Information.

North Dakota Station.—In view of the impaired quality of the local wheat due to the severe rust epidemic the department of cereal chemistry has undertaken milling and baking tests on a comprehensive scale of samples of wheat collected from all parts of the State. Tests to date show that the light weight wheat produces loaves of excellent volume. The color of the loaf is somewhat darker than that from wheat of high test weight, but otherwise apparently of excellent quality.

Two station field days were held July 29 and 30. The members of the State Board of Administration and State officials were special guests at the first, and the general public was invited to the second. The work of the station was shown by visits to the field plats, the barns and feed lots, and some of the laboratories.

Oregon College.—Dr. W. J. Kerr, for 25 yr. president and since 1932 chancellor of the State System of Higher Education, has been appointed chancellor emeritus. Dr. Frederick M. Hunter, chancellor of the University of Denver, has been appointed State chancellor beginning September 1.

Utah College and Station.—R. J. Becraft resigned September 15 from the range management work to accept a similar position with the University of Idaho.

Vermont University.—Dr. Frank A. Rich, associated with the veterinary work of the institution since 1891 and professor of veterinary science since 1901, died September 25 at the age of 74 yr.

On the same day, Richard W. Smith, Jr., professor of dairy manufactures since 1927, was killed in an automobile accident at the age of 37 yr. He was a native of Vermont, but graduated from the Massachusetts College in 1921 and received the M. S. degree from the University of Illinois in 1926. He had made a notable record in teaching both in Vermont and in the Massachnsetts College.

Wyoming Station.—In cooperation with the U. S. D. A. Bureau of Agricultural Economics, the Agricultural Adjustment Administration, and other State experiment stations, the station carried on a project on land use adjustment from April 1 to September 30. A new project entitled Bread Making with Wyoming Hard Wheat Flours has been initiated by the home economics department at the request of workers in home economics in the extension service and of housewives throughout the State.

Dr. R. S. Justice has been appointed assistant pharmacologist beginning September 1, vice Dr. J. H. Draize, resigned to accept a position with the U. S. War Department at the Edgewood Arsenal in Maryland.

New Journals.—*Phytologia* is being issued by H. A. Gleason and H. N. Moldenke from the New York Botanical Garden, thus far about semiannually, as a channel for the prompt publication of original articles dealing with research in all lines of botany, as well as biographical sketches, critical reviews, or summaries of literature. A unique features is announced as the financing of the magazine "entirely by its contributors, each one paying, in advance, for the entire cost of printing, binding, and distributing his contribution", and receiving at the end of the year a refund from the subscriptions proportional to the space utilized.

The Journal of the Australian Institute of Agricultural Science is being published quarterly at Sydney, New South Wales. The institute was established January 17, 1935, by delegates from the various agricultural scientific societies under the presidency of Dr. A. E. V. Richardson of the Waite Agricultural Research Institute and with A. J. Vasey of the State Research Farm at Werribee, Victoria, as secretary. The initial number of the journal contains a number of brief articles and addresses, technical and news notes, etc.

The Botanical Review is being published monthly from the New York Botanical Garden for the purpose of interpreting botanical progress through reviews on topics approved by advisory editors for the various fields. The initial number contains two papers: Possibilities in Plant Virus Classification, by L. O. Kunkel (pp. 1–17), and The Structure of Protoplasm, by W. Seifriz (pp. 18–36).

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